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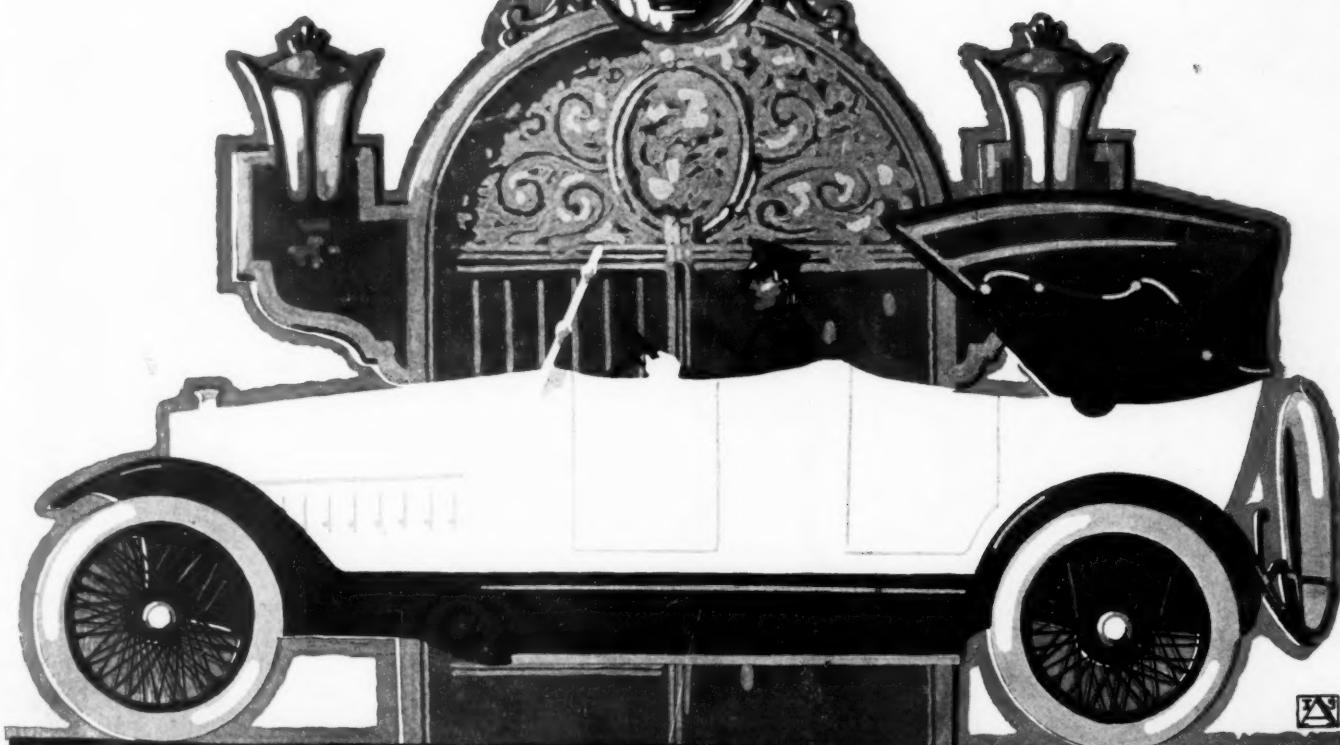
NEW YORK, AUGUST 31, 1916

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Just what every Ford owner needs, and wants—a Cowl Board beautifully finished in black enamel with a Stewart Speedometer, set off with a heavy nickel flange, mounted in the center.

It's a beautiful job.

And it gives a finished appearance to the Ford dash—and brings the speedometer up in a position where it can be easily read—even at night.

Ford owners are going to literally snap up this new Stewart product as soon as they see it. It is put on so easily—and is such a marked improvement. And the price complete is only a trifle more than the cost of the speedometer itself.

Dealers, think of the market this new Stewart Product opens up for you.

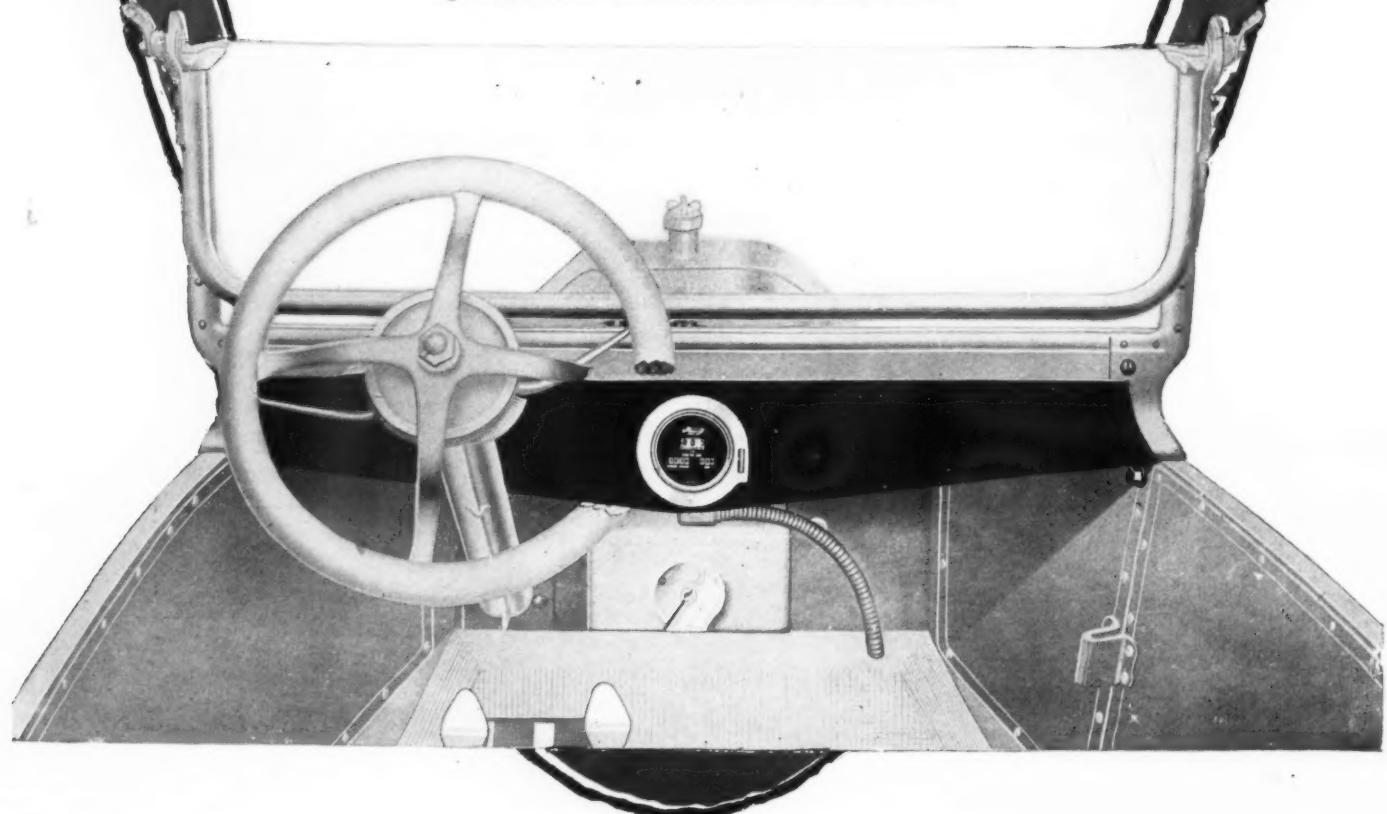
Speedometer for Ford \$10

Cowl Board \$1.25 Price Complete \$11.25

*"It will pay you to see that the car you buy is equipped
with Stewart Products"*

The Stewart-Warner Speedometer Corporation
Chicago, Ill., U. S. A.

Stewart
Speedometer and Cowl Board for Fords



The AUTOMOBILE

VOL. XXXV

NEW YORK—THURSDAY, AUGUST 31, 1916—CHICAGO

No. 9

Cashing in on an Ill Wind

Railroad Strike Would Mean Opportunity to Cars and Trucks

NEW YORK CITY, Aug. 30—Should the threatened national railway strike materialize, automobiles and motor trucks will be offered the greatest opportunity in the history of the industry to demonstrate their ability in practical inter-city service. Already every city in the country is turning to the automobile as a possible means of passenger travel. More important still, these cities are looking to the motor truck as a means of furnishing their populations with food and other necessities from which the cessation of railroad operation would cut them off.

For Inter-Urban Work

Passenger lines may be organized for inter-urban transportation and if the strike should prove of appreciable duration these lines could be arranged without difficulty to form a network covering practically all the more thickly settled portions of the country.

The same applies to motor trucks so that passengers and goods could be carried from Boston to New York by one line, for example, and thence by another line, or perhaps a continuation of the same one, to Philadelphia and so on to Baltimore, Washington, etc. Chicago and Detroit, Buffalo and Cleveland and other large centers not separated by too great distances could be similarly supplied. Operation in a commercial way on such a large scale would do much in proving to the general public the efficiency and economy of the modern automobile and motor truck.

Car, truck and accessory manufacturers, like all other industries, would be handicapped in making deliveries if the

railroads stopped running but in the case of the cars and trucks, these could be delivered under their own power in the form of driveaways from the factories to points not too far removed. Accessories would have to be shipped by motor trucks like all other commodities.

Chevrolet \$490 Electrically Equipped—Baby Grand \$50 Higher

NEW YORK CITY, Aug. 26—The Chevrolet Motor Co., this city, has raised the price of its Baby Grand model from \$750 to \$800 and also announces that hereafter the price of \$490 for its small model, known as the Four-Ninety, will include electric light equipment and electric self-starter. Heretofore, the Four-Ninety model equipped with electric lights and starter sold at \$550.

Daniels Price Raised \$200

NEW YORK CITY, Aug. 28.—The price of the Daniels eight will be increased on Sept. 1 \$200, to \$2,800 on all models.

Lozier Resigns as H-A-L Head

CLEVELAND, OHIO, Aug. 29—H. A. Lozier has resigned as president of the H. A. Lozier Co., this city, maker of the H-A-L twelve.

Murphy Resigns from Chalmers

DETROIT, MICH., Aug. 28—Gail Murphy, advertising manager of the Chalmers Motor Co., has resigned.

Jones with Federal Brass Works

DETROIT, MICH., Aug. 28—The Federal Brass Works has appointed L. P. Jones sales manager.

Hebner Joins Bearings Service Co.

DETROIT, MICH., Aug. 28—A. K. Hebner, service supervisor of the Hyatt Roller Bearing Co., has resigned to become general manager of the Bearings Service Co.

Haynes Sold to N. Y. Syndicate?

\$4,500,000 for Stockholders in Addition to Half Stock of Holding Company

INDIANAPOLIS, IND., Aug. 29—By a deal made last week the stock of the Haynes Automobile Co. of Indiana may be taken up by the Haynes Automobile Co. of New York, a holding corporation, a consideration of \$4,500,000 being paid to the stockholders of the Indiana corporation, in addition to receiving half of the stock of the holding company. Plans already are under discussion for placing a cheaper car on the market, to be known as the Junior Haynes.

Horace C. Stilwell, a promoter of Anderson, Ind., who represents New York financiers, signed an agreement with the stockholders of the Haynes company on Aug. 23. The agreement provides that 90 days shall be given the New York group to consummate the deal. The holding company is to have 600,000 shares of stock. Each stockholder in the present Haynes company is to receive six shares of the holding company's stock for each share of the present stock. It is proposed to place the other half of the holding company's stock on the market. The agreement provides that the present stockholders are to elect half of the board of directors.

According to announcements coming from Kokomo, A. G. Sieberling, who has been manager of the company for the last 3 years, and his assistants will remain in charge should the deal be consummated.

Dodge Resigns from Houk

BUFFALO, N. Y., Aug. 28.—L. G. Dodge has resigned as general sales manager for the Houk Mfg. Co., this city, to take effect Sept. 1.

Lamp Standards Are Progressing

S. A. E. Experiments Approach Solution of Glare Problem—May Eliminate Focusing

NEW YORK CITY, Aug. 29—It is thought possible that the experimental work now being done by the electrical equipment division of the S. A. E. standards committee may result in a great reduction of glare in headlamps and also in the elimination of all focusing devices. A focusing device is only an adjustment to counteract the ill effects of inaccurate reflectors and lamp bulbs. Experiments made at Nela Park, Cleveland, by a committee of the division some months ago showed that certain types of bulb filament and certain types of reflector were less sensitive than others, that is to say, they found it possible with some bulbs and reflectors to alter the adjustment of the focusing device quite considerably without affecting the nature or quality of the light seriously.

Another meeting held at Cleveland last week discussed the results of the tests having full specifications of the best bulbs and reflectors before them, and ascertained that it is possible commercially so to make bulbs and reflectors that any pair will assemble correctly without individual focusing.

The essential with respect to the bulb is that the filament shall be truly central within fairly fine limits, and for the reflector the focal length must be close to $1\frac{1}{4}$ in. With a reflector accurate in form within the limits of normal manufacture and with a bulb just a little more accurate than the present average and the right shape of filament no focusing is necessary.

Size of Filament

The committee on lamps reported the results of their meetings to the whole electrical equipment division at a meeting here to-day and the following subcommittee report and suggestions were approved:

The vacuum bulb which was selected as most practical at the tests had a filament in the form of a helix 2.5 mm. in diameter and 4.2 mm. long. The gas-filled bulb which was selected had a V shape filament, the spread of the V being 3 mm. and the height 2.5 mm. Both of these were $2\frac{1}{2}$ amp. bulbs.

The National Lamp Works is making both $1\frac{1}{2}$ -in. and 2-in. bulbs with filaments located the same in reference to the base. Filaments are located by eye in manufacture, and the variation is held within $1/16$ -in. plus or minus. If jigs are introduced to secure more accurate

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location, the expense will be greater and the manufacture slower.

It is possible to locate the centers of filaments within $1/64$ in. of the true axis and within $1/32$ in. of standard distance from the pins in the base. Figures will be furnished as to the approximate increase in cost per bulb if they make the necessary apparatus and perform the necessary operations to locate centers of filaments within these limits.

The subdivision tentatively recommends that for all headlamp bulbs the center of the filament be located in the axis of the bulb, $1\frac{1}{4}$ in. from the nearer or locating side of the locating pins of the base.

Vacuum bulbs are to have filaments in the form of a helix 4.2 mm. long and 2.5 mm. in diameter.

Gas-filled bulbs are to have filaments in the form of a V (each leg of the V being formed of a fine helix) 3 mm. wide at the base and 2.5 mm. in length. The plane of the filament is to be at 90 deg. from the plane of the locating pins.

These tentative recommendations are to be tested out under manufacturing conditions by the latter part of November, after which time the final report can be made.

Reflectors

The subdivision recommends that reflectors be made as near as possible to the outline of a true parabola of $1\frac{1}{4}$ in. focal length. The receptacle shall be located concentric to the reflector and so that at the central point of adjustment in the reflector the portion of the bayonet slot where the pin comes to rest shall be $1\frac{1}{4}$ in. from the focal point of the reflector.

Tail-Lamp Glasses

Investigation has shown that practically all makers of tail lamps are using glasses having a nominal diameter of 3 in. with tolerance of minus $1/64$ and plus $1/32$ in. It is recommended that these dimensions be made standard.

American Junior to Compete with Jinrikisha

INDIANAPOLIS, IND., Aug. 30—The American Junior, a little car carrying two passengers, is to be built here to compete with the jinrikisha in China and for juvenile trade. This car, with a 40-in. tread and a 70-in. wheelbase, will be built by the American Motor Vehicle Co., Lafayette, Ind., beginning Sept. 1.

The company will also manufacture motor chairs, which are driven by storage batteries. The directors are Jacob Weisenthal, Lafayette, president; Louis Marx, Chicago, vice-president; and W. M. Crockett, Lafayette, secretary. B. J. Mills, Chicago, is one of the principal stockholders. The capital is \$25,000.

August 31, 1916

S. A. E. Session in Show Week

1-Day Professional Session with 2 Days for Committee Work—Dinner Thursday, Jan. 11

NEW YORK CITY, Aug. 28—According to the plans now under discussion, Tuesday, Wednesday and Thursday of New York show week in January are the days that S. A. E. members should bear in mind. They are the days of the annual mid-winter meeting. This year the New York automobile show is held a week later than formerly, so that the New Year's holidays are not molested as they have been for years past.

The show week begins Saturday, Jan. 6, and ends the following Saturday night, Jan. 13.

The annual S. A. E. dinner, the social feature of the week, will surely be held in Hotel Biltmore on Thursday evening, Jan. 11. The grand ball room with capacity for 750 guests has been selected because in connection with this hall are other large reception halls that have accommodation for that number.

As a climax to the dinner the Society through its 1916 Meetings Committee has secured the Midnight Frolics for that night, practically the entire seating space being reserved for S. A. E. members and guests.

Thursday will be the big day for professional papers, discussions, etc. The session will start at approximately 10 a. m., the official morning hour for New York show week and the work will be over at 4 p. m. At noon there will be a buffet luncheon. This session will be held in the large assembly room of the Engineering Societies Building.

Although Thursday will be the big Society day of the week, the work of the session will start Tuesday, when the many committee divisions of the Standards Committee will meet and add the finishing touches to their various reports.

Wednesday will be an important day. In the morning at 9.30 will be held the usual business session for various reports such as membership, treasurer, election tellers, the discussion of constitutional amendments and other work. After this short business session of an hour the various reports of the Standards subcommittees will be presented for final action by the Society. This will occupy the remainder of the forenoon.

Wednesday afternoon will largely be given over to a consideration of aviation matters. There will be at least two important papers on aeronautical topics, and these will be followed by three 15-minute discussions on important aviation subjects, to be announced later.

Illinois Farmers Want Tractors

Their Problem Is Quest for Best Size and Type—Too Many Models

BLOOMINGTON, ILL., Aug. 25—The Illinois farmer who visited the 5-day tractor demonstration held here this week is not concerned over whether he shall buy a tractor or not. He has already settled that question. He has made up his mind that he must have a tractor and he is going to buy one. The problem that is worrying him to-day is what tractor he will buy. His vexing problems are what size of machine, and what type of machine. Size and type confuse him immeasurably.

The attendance was much larger than exhibitors had anticipated. The opinion was expressed very freely that although the numbers were not quite so great as at Fremont, the demonstration was quite as successful, from a business point of view. Perhaps the reduced attendance may partly be explained by the fact that Henry Ford and his new tractor were not present.

The attitude of the farmer toward tractors was well answered by the fact that at Wednesday's demonstration more than 5000 automobiles were on hand, a large percentage of these representing farmer machines.

Standards Needed

One of the most serious handicaps to the more rapid development of the tractor business is the very apparent uncertainty of tractor manufacturers as to the most suitable type of tractor. Frequently a farmer asking for information finds that he cannot get any convincing advice regarding the size of machine best suited to his requirements. The position is not improved by the attitude of more than one of the old implement manufacturers, as several of these concerns are making a needlessly wide range of machines. When one firm has six machines all quite different, the tendency is to put it up to the farmer to decide what he wants rather than to advise him to have one or another. When it is obvious that the manufacturer has not made up his mind as to which is the best type the farmer's confidence is naturally not very swift in coming.

The variation in type is certainly holding back the sale of tractors because the technical arguments placed before the farmer by different manufacturers are so antagonistic. For example, the champions of the very low-speed and the moderately high-speed engines are very bitter regarding each other, and the farmer cannot possibly reconcile the statements

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made by the two camps. It is the same with different systems of transmission. The tractor is nowhere near the stage of development reached by the automobile and the least discerning can readily perceive this. Consequently the more the tractor men get together and the more closely they agree from the broader features of design the easier will it be for the farmer to make up his mind and the greater the number will be sold.

Brown-Lipe Gear Buys Deere Plow Plant

SYRACUSE, N. Y., Aug. 25.—As a starter to practically doubling its output, the Brown-Lipe Gear Co. has purchased the Fayette Street plant of the John Deere Plow Co., this city. The new purchase gives this company an entire block of its present plant on Fayette Street.

Last week the executive offices were moved into what were the executive offices of the plow company, and as rapidly as the change can be made the grinding department, control set department, tool room, rough stock department and service department are being taken out of the old plant and moved into part of the new plant. The balance of the new plant is being equipped with new machinery and the entire new plant will be in full swing by the first of the year.

U. S. Truck Capital \$1,000,000

CINCINNATI, OHIO, Aug. 24.—Increased from \$300,000, the capital of the United States Motor Truck Co. is now \$1,000,000. This increase was made at the annual meeting held here recently. The new stock is both preferred and common, the preferred being 7 per cent cumulative and participating with the common up to 10 per cent. A part of the issue has been subscribed to by present stockholders and an additional block offered to the public.

Besides the regular 7 per cent dividend on the preferred the directors have placed an additional sum in surplus. The company was established 7 years ago and in 1914 was reorganized with R. C. Stewart as president.

Parker Collapsible Rim Corp. Formed with \$5,000,000 Capital

DOVER, DEL., Aug. 24.—A charter has been filed here by the Parker Collapsible Rim Corp. to manufacture and deal in and with rims and parts of automobiles and other vehicles. The capital is \$5,000,000.

Perkins-Campbell Adds 10,000 Sq. Ft.

CINCINNATI, OHIO, Aug. 25—The Perkins-Campbell Co., this city, has added 10,000 sq. ft. to its factory. A second additional building with over 8500 sq. ft. is being rushed and will be added to the plant about Sept. 15.

Republic Truck Expands

Offers \$750,000 of 7% Cumulative Preferred for Expansion of Business

NEW YORK CITY, Aug. 26—Conservative financing has been undertaken by the Republic Motor Truck Co., Alma, Mich., in offering \$750,000 of 7-per cent cumulative preferred of \$100 par, through George H. Burr & Co. of New York.

Of an authorized capitalization of \$1,000,000 preferred stock, \$750,000 has been issued. None of the 62,500 shares of common which are authorized has been issued, nor has it any par value.

Financial Condition Sound

The exceedingly sound financial condition of the Republic company is indicated by the fact that it has no bonded indebtedness, nor can it have any except by consent of three-fourths of the outstanding preferred stock. Similar referendum is required in order to increase the preferred beyond that already authorized.

The company was established in July, 1913, with a paid-in capital of \$8,000. Its capital and surplus, prior to the sale of this latest issue of preferred stock, was \$852,219.98, \$269,300 of which represented cash contributed from time to time. Dividends of \$198,717 have been paid.

The entire proceeds of this issue of stock will go into the treasury of the company to care for the development of its business, the nature of which has been rumored, but not officially made public. According to an audit by Price, Waterhouse & Co., the balance sheet as of June 30, 1916, with the addition of the new capital, will show tangible assets of over 210 per cent and net quick assets of more than 169 per cent of the preferred issue. The certificate of incorporation requires that the net quick assets must be at least 100 per cent of the outstanding preferred.

Net earnings for the fiscal year ending June 30, 1916, according to Treasurer George W. Moore of the Republic company were \$530,593.66, or ten times the requirements for preferred stock dividends.

The company has 407 agents, of whom 309 are exclusively devoted to the sale of Republic trucks. In the first 6 months of the concern's existence, from July 1, 1913, to Jan. 1, 1914, fifty-four trucks were sold. In the calendar year of 1914, 376 trucks were sold. In 1915, 1855. In the first 6 months of 1916, 2780. Since the beginning of the war, 4837 trucks have been sold, of which but 212 were on war orders.

ACCESSORIES

In

South America

No. II

Dealers Need Batteries, Jacks, Garage Tanks and Air Compressors—Oils and Greases Find Ready Market

By David Beecroft

IN addition to the spare parts, accessories and speedometers reading in kilometers wanted by the Ford dealer in Cordoba, Argentina, as mentioned in the first part of this article last week, he wants some form of constant lighting electric system for Fords, his request being only one of many similar ones received. Ford has been selling over 300 cars per month in Argentina, Chile and Uruguay. One month it rose to 470 cars; that was last February. With this output there is certainly a large demand for lighting as well as starting outfits. The people buying Fords have generally plenty of money. They are so pleased with the way the cars perform as compared with the impossibility of using the expensive European cars that they are glad to get anything additional that aids them.

Batteries Follow Cars

More U. S. A. starting and lighting batteries are needed. We must have them for nearly all of the 800 cars. Batteries are sure to give more or less trouble in Argentina. They gave us trouble in the U. S. A. the first year or so of electric starters, simply because our owners did not give them the attention they should have—generally distilled water when needed. That trouble is facing Argentina. Everywhere our batteries were conspicuous by their absence. We saw the Willard in several places, only one or two in a place; a few Vestas and a few Exides. There were more French batteries, and we were generally told of the superiority of the French types. It reminded us of the fact that we must look to our own interests in this work. Our battery people will have to fortify themselves in Argentina, Brazil, Chile, Uruguay and many other South American countries, as well as in the West Indies. In the fiscal year we shipped 4444 cars to Argentina alone. We shipped to all of South America 6725 cars. Those that were Fords have no batteries but are in the market for batteries, starters and lighting outfits. We shipped to the West Indies 4658 cars, making a total of 11,383 to Latin America. Spanish instructions on how to take care of batteries will be needed in all of this field excepting Brazil, where Portuguese is needed.

Metal running-board boxes are good sellers.

Market for Jacks

There is a good market for jacks in Argentina. You see French and English types and a few U. S. A. varieties. One English jack with a long handle for easy operation was selling well. A Paris jack was also much in demand. Two or three U. S. A. houses were well represented, but the field can be exploited much further.

We might go on indefinitely through the accessory field endeavoring to show different lines of possibilities for our accessory makers. We could add gaskets of all kinds and sizes; wrenches and screwdrivers and like tools, which have largely been supplied by France and Belgium; clocks, which are in demand; tire-removing tools, tire-repair kits, and a score of others. Space will not permit. Enough has been said to suggest the remainder.

Tank System for Garages

A word on garage equipment. Up to the present all of South America has bought gasoline in the square 5-gal. can, two cans being crated together. This is the English system.



Upper—Typical garage in Montevideo in which accessories are sold in large quantities. This is modern building constructed expressly for garage uses

Lower—Auto-Sport is one of the large accessory houses in the City of São Paulo, Brazil. It handles all lines of accessories and is much interested in U. S. A. lines. Our cars have been good sellers in the State of São Paulo and the accessory market should be proportionately good

Previous to the war England supplied practically all of the gasoline to South America, but now the U. S. A. supplies all and still supplies it in the 5-gal. cans. This is a costly and unhandy way, and the movement is gaining headway to sell in bulk, as is done in the U. S. A. The first curbside gasoline pump in Buenos Aires was started in May. It was proving popular. Argentines may be a little slow in installing new devices, but they are not slow in grasping their advantages. The "you-are-next" rule was in force before it was in place a week. Bowser has a good representation in Buenos Aires, and by this date perhaps several curbside ones are in place.

Not a garage in Buenos Aires in June had gasoline pumps and bulk systems, but they are all in the market for such. Here is a real field, not only in all of Argentina but in all of South America and the West Indies as well. You can add much of Australia. The garage people are a little afraid of the price but are convinced that tanks will have to go in, and we hope that in a year or so the gasoline curbside pump in front of the garage in Buenos Aires will be as common as in our own cities.

Garage Air Compressors

There is a good chance for manufacturers of air compressors for garages. I could not find a garage in any South American city that had a compressed-air system for tire inflation. You have to use the hand tire pump every place. Our makers should get busy with this market. The air system is needed just as much in South America as in the U. S. A. Perhaps smaller systems may be needed. Generally the garages can accommodate fifty to 100 cars. You rarely find larger ones. Our makers should bear this in mind.

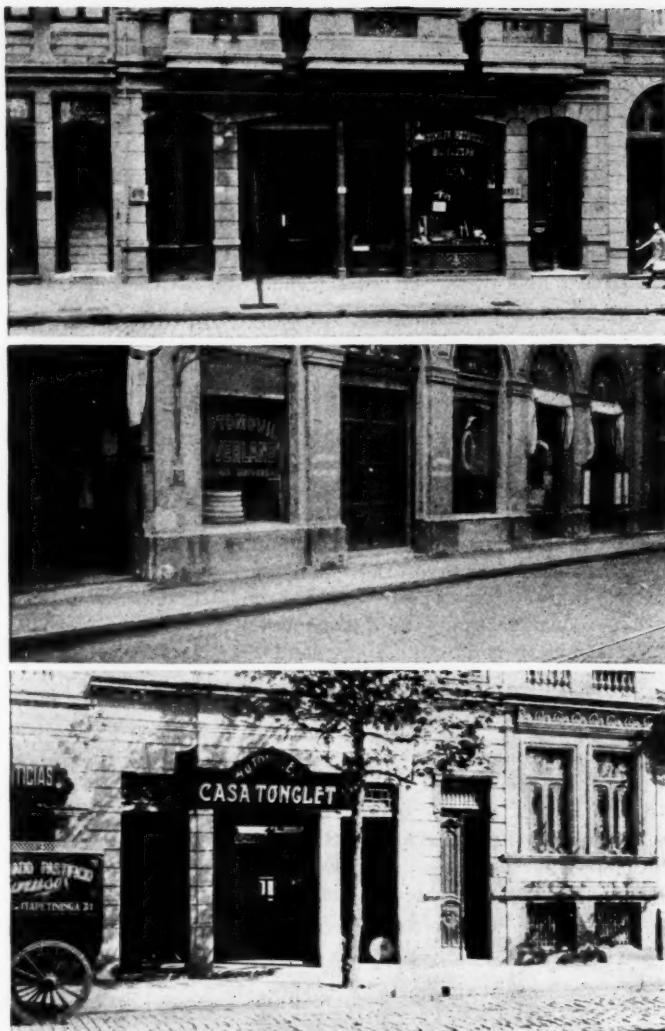
Nearly all garages in South America are good centers for selling accessories. They are generally immaculate so far as cleanliness is concerned. They are lessons to us in the U. S. A. in this respect. The manager invariably has a clean business office, and you never see the chauffeurs hanging around. There is invariably a good show window for accessories and generally a very large glass showcase for them. The chauffeurs are in the habit of buying many accessories from the garage.

One bad thing about South American accessory business is that the chauffeurs invariably try to collect 10 per cent commission on all goods bought. They do it on tires as well as on supplies. Added to this is the fact that accessories are generally sold on 90 days. The garagemen and supply-house men would like to eliminate the chauffeur's commission but have not been able to get together in a satisfactory way to do it.

Oils and Greases Sell Well

U. S. A. oils and greases are generally good sellers in South America. One or two brands have good blue-and-white or yellow-and-white enamel signs that you see in most of the garages and supply houses. Generally oil and grease are handled by large concerns that have their own representatives in Argentina and Brazil. Previous to their establishing themselves there were many troubles, and still are. One of the commonest abuses was U. S. A. oil companies not sending the grade of oil ordered. We saw one shipment of oil that was entirely too thin. The shipment was not according to order. Apparently the oil man in New York thought he knew better than the Rio dealer. The result was that the dealer started buying from an oil company that would ship him the grade of oil he wanted. He ordered in \$3,000 lots.

Another example was that of a grease shipment which did not come as per order. It was necessary to buy a supply of thicker grease and mix with the first order. On a successive order the price was raised on the Sao Paulo dealer. The re-



Upper—This is one of the largest automobile accessory houses in Montevideo, a city of 375,000 population and the capital of Uruguay, which, although the smallest country in South America, and having a total population of 1,300,000, is a very active motor car country and has more miles of improved highways than any other country in South America, Brazil and Argentina included.

Middle—This reproduction of the Overland agency in the City of Rosario, Argentina, shows how car dealers generally handle accessories and display them in the window. Inside there is invariably a good showcase well stocked with accessories.

Lower—Casa Tonglet is one of the several large automobile accessory houses in the City of Sao Paulo, Brazil. This house handles U. S. tires for the State. It carries a varied line of accessories but is not so strong in U. S. A. accessories as it should be.

sult was that now he buys his grease in bulk from Europe—he is still able to get it—and he has made his own cans with his own labels and markets the grease under his own name. He has no objection to selling U. S. A. greases, but the prices must be lower.

Still another example of where our prices will have to be lowered was the case of carbide in Sao Paulo, Brazil. The dealer bought it through a New York exporting house, paying 36 milreis per unit in Santos, and on top of that he had to pay the freight from Santos to Sao Paulo. He was able to buy it from a German house in Sao Paulo for 34 milreis per unit, with no freight.

Bad Business Examples

In a trip visiting a score of supply houses you meet with many examples of bad business. Very frequently these supply houses buy through exporters who sell them goods that are not trade-marked and there is no possible way of telling where they were made. I saw one shipment of a dozen hand horns, and out of the dozen eight would not make a single note. There was no name on the horns and no way

of telling where they were manufactured. The dealer went back through the exporting house, but had not got any redress at the time I saw him.

Another example was an oil shipment in a camp town in Argentina. The oil was in 5-gal. cans with a New York label. The oil was so thin that it was useless. Trade records show no New York house of the name carried on the label. The job may have been put up by some house that was simply exploiting foreign trade. It was a bad advertisement for us.

All cases of this kind hurt U. S. A. goods. Their bad odor travels far and wide. It is no wonder U. S. A. accessories are not so much in demand in some places as they should be. We want our best men in South America to establish our trade there.

Co-operative Accessory Selling

Bad business of this nature suggests that some co-operative plan of introducing our accessories may be necessary in Buenos Aires and also in Rio de Janeiro. In these two cities we should have large supply houses well stocked with our goods. If the existing houses will not adequately stock our goods but prefer to favor European lines, then it is essential that we take active steps to establish ourselves. It would be wise to consider going so far as several of our accessory concerns not in conflicting lines combining to open one shop in each place for the sale of goods.

By establishing such a house those makers would be assured of proper representation. They could carry adequate stocks of parts, and could have one or more representatives selling the goods through the respective countries.

England has several large department stores in Buenos Aires, in Rio de Janeiro, in Sao Paulo, and other cities. Naturally, these stores push English goods. It is a wise foreign policy to establish such stores. To-day it looks feasible that it might be wise to open a large supply house

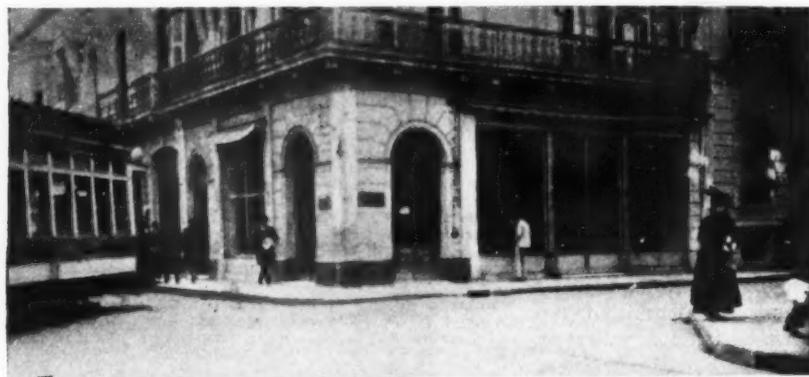
in Rio and another in Buenos Aires for U. S. A. accessories. It is too expensive for many of our individual makers to open shops for their own line. That would prove impractical. But co-operation can solve the difficulty.

We found quite a few examples of where South American supply houses are buying direct from U. S. A. agents, and in not a single instance did we find any difficulties. The goods invariably came as ordered, they were properly packed, and prices were generally lower than where the goods were bought through a New York exporting house.

Get Close to Market

The main objection to so many of our large concerns selling through exporting houses is that the manufacturers do not get in as close business relationship with the South American retailer as they should. There are many abuses that never reach the ears of the manufacturer. He may note that the sale of his goods is dropping off, but he may never learn the exact reason. By establishing a Buenos Aires representative he will keep in close touch with his market and be in a much better condition to build up an export trade.

To-day a large percentage of the sales of our accessories there are not active sales, but rather orders filled by exporting houses in response to orders from South American houses. It would surprise you to see the line of goods manufactured by some of our largest houses and yet sold through exporting concerns. Such business is not permanent business, and such is not the correct way of building up a foreign business. The business is worth going after, and going after in a businesslike way. We should go after it to-day, otherwise our goods will gain a reputation for higher prices than European lines, due to the added percentages charged by exporting houses for their work. This can be saved by direct business. To-day we cannot afford to get a reputa-

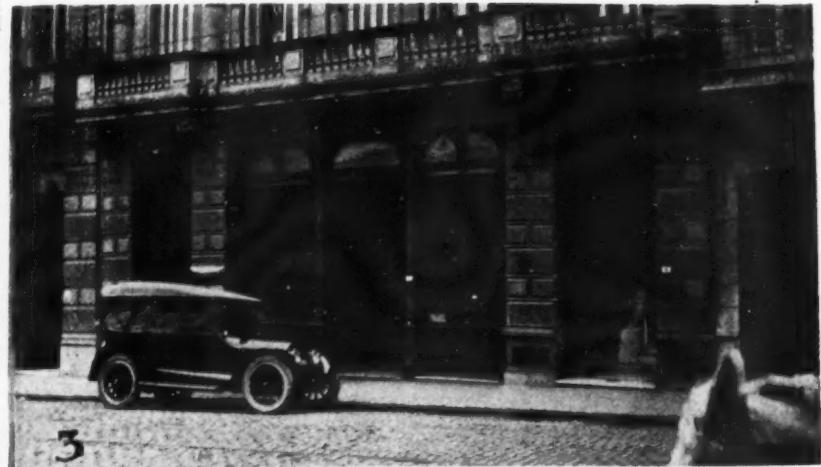


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1—This shows the salesroom of the Ford dealer in Montevideo. There is the usual salesroom with good display windows. Inside you find a very complete line of accessories and spare parts. From this house the whole of Uruguay is controlled



2—Here is a typical accessory store in a Brazilian city. The show window in front is well filled, and window dressing is about as well followed out as in U. S. A.



3—This is the agency of Cadillac and Chevrolet in Montevideo. It is typical of those large machinery houses that make motor cars a side line. The front windows are not used for car or accessory display. The accessories are generally handled on side shelves, resembling a hardware store



1—This is the Ford agency in the City of São Paulo, Brazil, from which over 800 Fords have been sold. This agency has a fine show room and in addition has a separate store for spare parts and accessories. Tires of several well known U. S. A. makers are also carried in Ford sizes

2—This is the display window of Antonio Prado in São Paulo, who carries a stock of accessories worth \$50,000 U. S. gold. It is the largest accessory stock in São Paulo and a very complete one. Every line of European accessory is carried and many U. S. A. lines, but there are many U. S. A. lines found missing. Senor Prado has found it hard to do business with many U. S. A. firms, which accounts for too few of our goods

3—This is the Hudson dealer in Montevideo, Uruguay. It is a typical modern business place. Inside you find show cases filled with accessories. No more modern business place could be found. The store is as clean inside and out as one of our own. Cars are displayed in exactly the same way

tion for high prices on our goods. Such reputations will live after we lower the prices, and will be sure to work us injury when Europe gets back in the market.

Need Spanish Stenographers

In carrying on business direct with the large supply houses in Buenos Aires, Rio de Janeiro, São Paulo, Santiago, Montevideo, and other cities, we must conduct business correspondence in the language of the country. For Brazil, use Portuguese, and for all of the other countries Spanish. You cannot satisfactorily carry on business correspondence in English. There is not any difficulty in securing competent Spanish stenographers in U. S. A., but you will have to pay them more than you pay the average stenographer.

You must get catalogs in Spanish and Portuguese. Do not send catalogues in English, as it only tends to give the impression that you are snatching a little easy business and that you do not intend to stay permanently in the field. You must go into the field for keeps, to stick. That is the greatest business advertisement you can use. South Americans like to see us go there to stay. They will trade much quicker with us when they see us sending our own men, opening adequate quarters, and building for the future.

Make your catalogs simple, much more simple than you would use for the U. S. A. The Latins of South America are not so mechanically inclined as are our people. They are more given to arts, music and sculpture. They like illustrations, and your catalogs should abound with them.

Keep Prices Out

Do not put prices in the catalogs. There are several reasons for it. First, the South American dealer must pay the freight, he must pay the customs, and he must pay marine insurance, and, in these days, war insurance. His selling price must be based on all of these factors, and so,

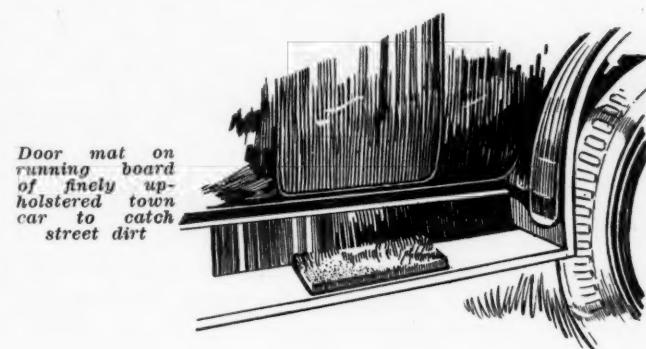
if any U. S. A. maker tries to add prices to his Spanish or Portuguese catalogs for South America or the West Indies, he is only clogging the wheels.

(To Be Continued)

Door-Mat for a Town Car

WHEN the interior of a closed car is fitted up with delicate trimmings and carpets like a lady's boudoir, and many cars are of this nature, it is an advantage to keep dust and mud off the floor, yet anyone stepping into the car from the street cannot help carrying a little dirt on his shoes.

To avoid this an idea which originated in Paris and ought to be popular in the big cities of America is worth mentioning. This is to have a small piece of stout door mat neatly cut and edged and strapped to the running board just below the door opening. The mat can be sewn to metal end pieces and screwed to the running board, or it can be fixed with screws and washers, the heads of the screws being well buried in the mat. As an accessory a device of this sort should sell well. It would need to be of a quality to suit high-grade cars, but need not cost a great deal.



Door mat on running board of finely upholstered town car to catch street dirt

Fascination in Tractor Design

Tractor Engineering 13 Years Behind Automobile—Concentrated Effort Will Overcome This Rapidly—Some Difficult Problems of Wide Scope and Many Minor Easy Ones

By A. Ludlow Clayden

AUTOMOBILE engineers are going to take up the tractor and men trained in the automobile industry are going to make possible 13 years of progress in 5 years or less. They are going to do this largely apart from any business reasons.

They are going to enter the tractor field as individuals because of the immense fascination of the machine. There are many passenger car engineers who have never been able to work up much enthusiasm over the motor truck, probably because the truck is rather like a passenger car shorn of many refinements, but the tractor has a different appeal. The effect of a first sight of a tractor demonstration is indescribable; one feels he is witnessing a manifestation of a new form of energy. It provokes much the same tingling of the blood as does the first sight of a speedway with a bunch of cars tearing past. Probably the explanation is that one sees and realizes in the deep-biting plows and the rapidly changing face of the landscape that same raw power which is the fascination of the speedway.

Whatever be the truth the fact remains that any man who took up automobile engineering for the love of the art has only to see a dozen tractors blazing their trail across acres of stubble in order to discover a new enthusiasm.

Development Will be Rapid

Even among tractor engineers it would be difficult to find a man who would contend that the gasoline tractor has reached more than an early stage in its development. To make a comparison with the automobile or motor truck is far from easy, the conditions of service and the requirements being so greatly different, but it is fairly close to the truth if we say that the gasoline tractor to-day is at about the same stage of its development as was the passenger automobile in 1903.

This does not mean that the tractor is going to need another 13 years to reach a stage equal in development to the 1916 automobile. Probably what took 12 years for the passenger car will be done in 5 or fewer for the tractor, general accumulated experience now being so much greater, but the amount which remains to be done will provide sufficient work to give the tractor engineers a very full 5 years.

An automobile engineer in approaching the problems of tractor design must first clear his mind completely of all prejudices. He must manfully resist the natural impulse to compare tractor features with, for instance, motor truck convention.

In many ways it would be possible to draw a closer parallel to the motor boat than to any road vehicle. Really, though, the tractor is not comparable with any other self-moving machine. While it is more difficult a problem than the automobile in some ways it is easier in others, but is essentially different. A most successful truck engineer could easily make a very bad tractor if he took on the job with a light heart.

None the less, the automobile is going to benefit by reason of what will be learned in developing the tractor. To give an example, the kerosene carburetor is essential to the tractor, and already experience is being gained which will be valuable throughout the whole range of internal combustion engineering. Another thing which is as yet imperfect for tractors is the ignition system, and a curious little thing which comes to light in this respect is a growing demand from the tractor men for a smaller spark plug, the engineers quoting all the arguments recently advanced by aeroplane engine builders in favor of the metric size of plug shell.

Six Major Problems

Having said that the tractor is as yet only partially developed it may be well to mention the major problems that are yet not overcome:

First: Reliability is not good enough yet, not nearly good enough. This is partly due to poor engineering that can be recognized as such and partly to the peculiarly difficult conditions of a tractor's work.

Second: The efficiency of the machine as a whole can be improved very greatly; must be improved, in fact. At present the horsepower at the drawbar and the horsepower at the flywheel are too widely different.

Third: The weight is usually out of proportion to the horsepower. Weight is an essential in order to permit a sufficient drawbar pull, but it can be applied scientifically so that every ounce tells, or otherwise. Frequently the amount of waste weight is as great as the amount of useful weight.

Fourth: The question of drive is unsolved. We have one-wheel, two-wheel, three-wheel and four-wheel machines, all-caterpillar machines and machines which are combinations of the wheel and the caterpillar. They cannot possibly all be right, yet there is not enough experience today to enable any one system to be named as the best for all purposes.

Fifth: The trouble of rapid turning is important. There are some machines which can turn in their

own length, but to do it they require mechanical features regarded as revolutionary by the more conservative builders. The advantage of a square turn is very great and it must be decided whether this advantage can be given without any drawback.

Sixth: Then there is size. We have now every conceivable size and power from very little to very much. There are too many sizes. The biggest machines will always have a market, but a limited one. The very small machine will also have its uses, but

it will have to be decided just what size the great big majority of farmers will find most efficient. This is best stated in terms of drawbar pull and the ideal size for general work is variously estimated at anywhere from 1500 up to 6000 lb. This is a matter for experience mainly, but study can help to solve the problem.

There is no need to itemize further; this will be done in a subsequent article when the different problems will be tackled one by one at greater length.

Torque and Ratio Determine Drawbar Pull

Fallacy of the Horsepower Rating Self-Evident When Its Variation With Speed Is Taken Into Consideration

THE belief is being rapidly accepted that the most logical method for rating tractors is by the drawbar pull rather than by the horsepower characteristics of the engine. If a rating of this nature is to be made it is necessary that some allowance be made for the nature of the soil through which the plow is to be pulled in order that the soil resistance factor may be taken into account.

To make such checking easy, the Hyatt Roller Bearing Co. has invented a hydrostatic instrument which can be placed between the tractor and the plow, and the gage mounted upon it registers the actual force of the pull which the tractor is exerting. In addition to the pressure gage there is a recording device which registers variations in the pull.

It has been pointed out that tractors working within a few yards of each other will show great differences in performance, although the horsepower ratings of the engines will be the same. One tractor may be pulling three plows and the other four and yet the ratings by horsepower will be equal. Of course, where the difference comes in is in the tractive speed. The actual work involves all the factors of pull, distance and time. It is impossible to get a performance figure unless all of these are included in the calculations.

With an instrument of the nature mentioned, the objectionable guess work rating is avoided. It is quite customary among farmers to make a rough guess at the performance rating of a tractor by stating that it is capable of pulling so many plows under average soil conditions. This is at the best only a rough approximation as the tractive pull necessary to carry a plow through different kinds of soil is subject

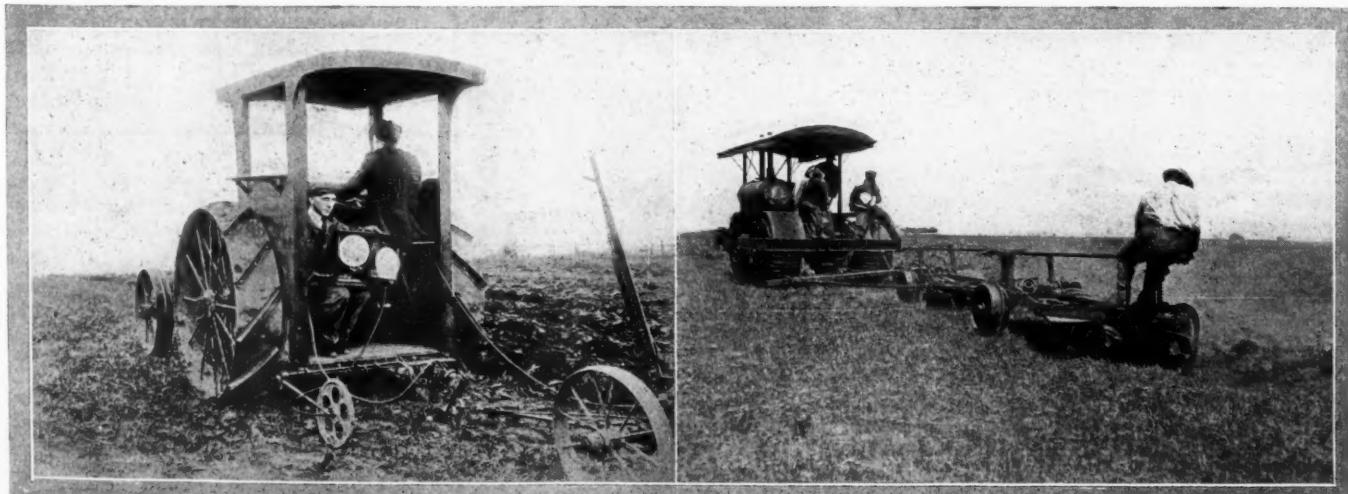
to the widest possible variation. Even in the same kinds of soil the pull required will vary with conditions.

It must be remembered that the torque of the gasoline engine is fairly constant through a wide range of motor speeds. With the torque constant the horsepower output will naturally bear a practically constant ratio to the speed or r.p.m. Pulling ability is determined fully by engine torque and gear ratio. It does not require a mathematician to see that if the torque is constant, and the gear ratio is constant, the pulling power of the tractor is going to be constant also for a wide range of speeds. The horsepower curve will be going up as the speed increases, however, and thus the fallacy of a tractor rating by horsepower is self-evident.

Coming to a practical rating by pull alone, the question at once arises as to how to secure a standard condition in order to make a rating. It is for a purpose of this kind that the hydrostatic instrument should be available. It has been suggested that the tests be carried out on a hard, dragged dirt road, and this really seems a practical manner of getting at the much-mooted question.

Power of Martin Engine

LEE N. GRIFFITH, the engineer responsible for the Martin-Griffith aviation engine described in THE AUTOMOBILE for Aug. 10, has written stating that the maximum power of the engine does not occur at 1326 r.p.m. but at about 2000 r.p.m. The official tests made at Washington was performed with a propeller and not a dynamometer.



Hyatt hydrostatic instrument for measuring pull mounted on a tractor under actual service conditions

Welfare Department a Factory Necessity

Sociological Work Is Not a Matter of Philanthropy But Results in Pure Gain to both Employer and Employee—Examples in Cadillac Plant in which their Work Is Under Well-Defined Jurisdiction

WORKMEN, performing their labor under advantageous conditions of health and mental well-being, give a better return for their wages than those who work under the opposite conditions. In a nutshell, this gives the entire selfish side of the factory welfare question. Taken as a matter of dollars and cents, of return for a given investment, a happy workman, and that means a healthy one, is a better paying proposition than one who is under the disadvantage of mental strain or ill health.

Sunshine, open air, sanitary conditions and freedom from accidents are the basic necessities for a high health rate among the employees of a factory. Men who are paying frequent visits to the hospital, or who are staying home on sick leave are a loss to themselves and the concerns which employ them. They are not happy, their thoughts are distracted by their own personalities and instead of the mind being on their work it is upon their own physical condition. In each individual workman in which this condition exists, there lies a loss for the concern that employs him. More important still from the human standpoint, there is a man who is not happy in his work and is therefore incapable of doing himself justice, no matter how he may try.

Output Versus Outlay

The automobile industry, in its mushroom-like growth has been compelled to expand in a very disadvantageous way, in a great many instances. More space to carry out greater production schedules has been demanded and the result is that there has often been no time to stop for the best possible layout of factory as regards the human welfare standpoint. Competition has been so keen that factories could not afford to lose time while adding more space and consequently the growth in the factory has led to results which compare with some of our older cities.

Where a city has been laid out new, in a new part of the

country, the streets are broad and regular. They run parallel to one another and are intersected at right angles by other streets. The houses are spaced regularly, the streets are clear and the sunshine has a chance to filter through. Old cities which have grown so fast that they have been unable to follow any well laid-out plan of development have crooked, winding streets that follow the old Indian trails. They are compelled to stick to the old methods because they are unable to grow and to change at the same time. So it is also in the automobile factory—to keep up with the march of progress it has had to grow, to keep up with the new ideals in manufacturing welfare it ought likewise to change.

The automobile industry is only now beginning to find itself. There have been factories advantageously located that have been able to adopt the new methods while developing, there are a great many others that are adding space at the present time and in this new space they are taking care that the welfare angle is given all possible attention.

In the past few years, we have heard much about the sociological side of a manufacturing plant. It has shown itself in direct and indirect ways. An example of the direct way is where the manufacturer has declared profit-sharing or bonus schemes that put cash directly into the pockets of the workmen. In the indirect way, the money has been spent by the factory in supplying more sunshine, more air, better conditions and often better food. The hygienic side of the factory worker's life is being looked into. In many cases even his family life has been made the subject of study by a special part of the employers' organization that is fitted to take care of this delicate work in a way that is suitable to a democracy.

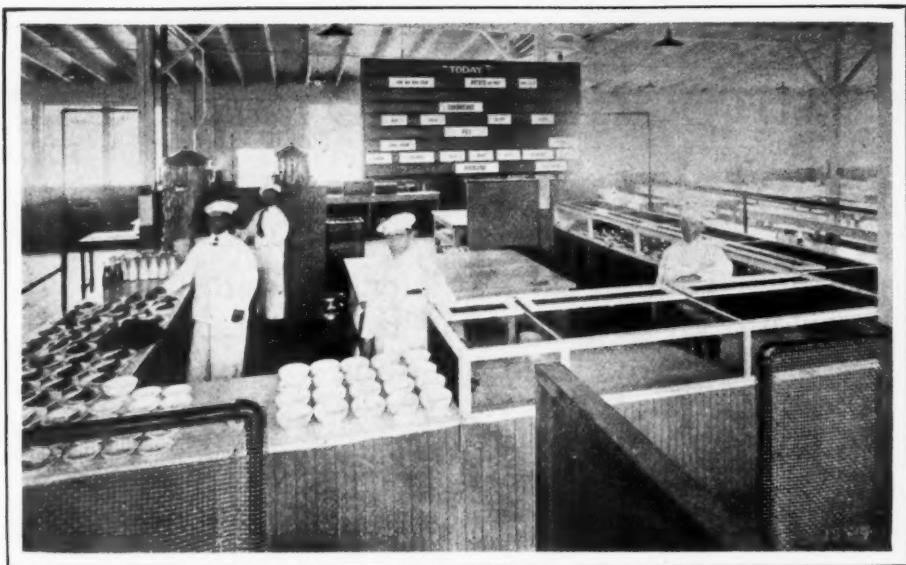
Not Philanthropy

It is not a question of philanthropy. If it were, the employee would be the only one to benefit. On the other hand, it is not wholly and purely economic, because the expert accountants cannot render even at the end of a stated period an exact statement as to the money saved or made through the establishment of the new methods. But it does represent a saving,—a saving to industry, a saving to the individual and also a saving to the family, in that it means fewer hours of unemployment due to illness or accident.

Taking the Cadillac company as an example of what has been accomplished, some very interesting things can be learned. It was in 1910 that this concern first established an organized welfare department. Before that time there were various unorganized schemes of assisting workmen who suffered from various combinations of adverse circumstances, but a close study of the question showed the officers of the concern that the men were not securing the maximum return even from the fitful efforts that were then made.



One of the lunch rooms in the Cadillac factory where pure food, well-cooked, is served



View of the lunch room at the main plant, showing menu board, coffee, pie, fruit and sandwich counters

All these different branches of activity naturally fell under the one head of sociology. It did not mean by any means that the Cadillac company was forced to philanthropical work among its employees, but it did mean that in order to see that the men and women in the employ of the company were getting the best possible nourishment and were kept in the best possible health that food supplied at actual cost, without loss to the company, well cooked, and above all clean, should be furnished.

If the number of factories having large bodies of workmen employed are considered it will readily be seen that few of them are surrounded by restaurants that supply good food at moderate prices.

The food question is not the only one which was taken up under the Cadillac organization. The prevention of accidents, prevention of fire, sanitation, accident relief, benefit society, legal aid and accident claim were also considered and made divisions of the department as well as that of lunch counter and restaurant.

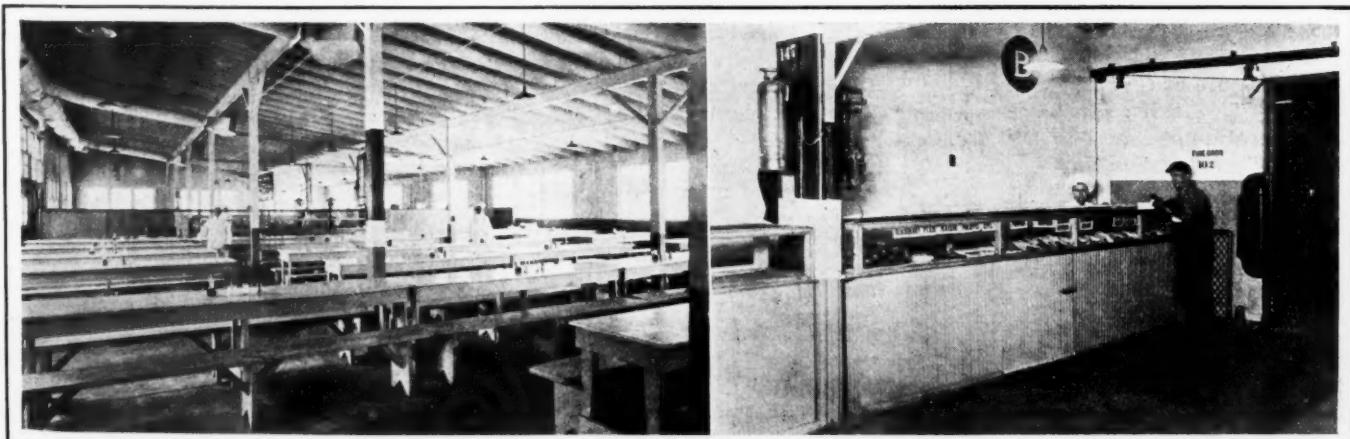
A Safety Engineer in Charge

The way this is worked out is quite simple. A safety engineer is in charge of the accident division, who, with two assistants, is directly responsible for cutting down accidents about the factory. Not only does he investigate existing safeguards, but designs others which are placed upon the apparatus about the plant. Failure on the part of workmen to observe the rules of this official and his staff will bring

cases handled here, 4300 cases of grippe in one winter, 6250 cases of headache, 800 cases of toothache and 437 cases of injury in which disability of more than one day was caused. Over 40,000 abrasions of a small nature were taken care of and more than 9000 cases of foreign bodies in eyes. Under the Workmen's Compensation Act, these eyes have a valuation alone of from \$3,500,000 to \$9,500,000. The men are encouraged to take all their ills to the doctor's office, no matter how small they may be.

\$35,000 in Sick Benefits

The Mutual Aid or Benefit Society paid in the first 3 years of its existence \$35,000 in sick accident and death benefits. A payment of 10 cents per week is exacted from each workman to take care of this fund. In the restaurant and kitchen work, a steward is in general charge. It started with stew being served at 6 cents a cup to the men. This proved to be so popular that a universal restaurant service was demanded with the result that an employee of the company can purchase an ordinarily 5-cent article of food for 3 4/7 cents. Milk is sold at the same figure per pint, and during a single year 456,000 pints of milk were distributed among the employees. The gross business of the restaurant division of the welfare committee is about \$50,000 a year and the cost to the company is practically nil. It is self-supporting and yet of untold value to the mental and physical condition of the men—and must bear its reflection in the quality of the work of the individual.



Left—One of the lunch rooms in the main plant. Right—One of the factory pie and fruit counters

dismissal and there is no appeal.

A fire marshal who is an experienced man, being a retired captain of the city fire department, is in charge of fire prevention. His duties are quite similar to those of the safety engineer, except that he is in direct charge of all means of preventing conflagrations. He is the court of final appeal in all fire matters as the safety engineer is the court of last appeal in accident-prevention matters.

Saves \$9,500,000 in Eyes

There is an emergency hospital always ready and always fully equipped. A chief surgeon is in constant charge of the hospital. His assistants form the remainder of a committee which looks after the medical and surgical end of factory matters in the same way as the accident and the fire committees look after theirs. Eye operations, etc., can readily be taken care of. In a single year there were 37,757 dispensary

cases handled here, 4300 cases of grippe in one winter, 6250 cases of headache, 800 cases of toothache and 437 cases of injury in which disability of more than one day was caused. Over 40,000 abrasions of a small nature were taken care of and more than 9000 cases of foreign bodies in eyes. Under the Workmen's Compensation Act, these eyes have a valuation alone of from \$3,500,000 to \$9,500,000. The men are encouraged to take all their ills to the doctor's office, no matter how small they may be.

Constant Pressure Efficiency 25 Per Cent Lower

Cannot Compare in Theoretical Efficiency with Constant Volume or Otto Cycle According to Napier—Mathematical Comparison of the Two Working Cycles

THE efficiency of the constant pressure cycle may be all the way from 25 to 60 per cent less than that of the constant volume or Otto cycle according to James Langmuir Napier who has just published in *The Automobile Engineer* a criticism of the paper on the constant pressure cycle read by Messrs. A. B. Brown and Herbert Chase before the summer meeting of the Society of Automobile Engineers.

In his criticism Mr. Napier makes a particular point of the fact that the authors, Messrs. Brown and Chase, state that they have purposely avoided the use of formulas having to do with the thermo-dynamics of the constant pressure cycle. He goes on to say:

"Neglect of elementary principles is always unsafe, and in this case peculiarly disastrous for the reason that the author's enthusiastic advocacy of the constant pressure cycle is confessedly founded upon a quasi-scientific statement, attributed to one R. M. Neilson, and promulgated by Henry D. Suplee, to the effect that with a compression pressure of only 30 lb. absolute (approximately 15 lb. gage) a constant pressure engine has an ideal efficiency of 84 per cent.

"This statement is so far from being true that it appears desirable to set forth exactly the results which might be anticipated from a constant pressure engine under 'ideal' conditions, understanding, of course, that while such conditions are impossible they constitute an easy but rough ground of comparison between engines in which combustion takes place at constant volume and constant pressure respectively.

"The basic diagram in respect of a constant pressure engine is indicated in Fig. 1. At the point *C* the gas is assumed to occupy *n* volumes at atmospheric temperature and pressure, both expressed in absolute units. Compression reduces the gas to one volume at the point *A*, and heat is added at constant pressure between *A* and *B*, which latter point is here assumed to be the end of the stroke. The equation to the curves *BD* and *ACE* is $PV^{1.4} = \text{Const.}$, and these curves are supposed to extend infinitely. Under these conditions the heat added during the cycle is represented graphically in *PV* units by the area *ABDEC*, and the work done during the stroke by the area *ABC*. The principal pressures and temperatures are:

$$\text{Pressure at } C = 14.7 = p$$

$$\text{Temperature at } C = T = 290^\circ \text{ abs. Cent.}$$

$$\text{Temperature at } A = Tn^{1.4}$$

$$\text{Temperature at } B = Tn^{1.4}$$

These quantities are calculated in Table I. for values of *n* up to 10.

TABLE I

<i>n</i>	$pn^{1.4}$	$Tn^{1.4}$
2	38.79	383
3	68.42	450
4	102.30	505
5	139.90	552
6	180.60	580
7	224.10	632
8	270.20	666
9	318.50	698
10	369.30	728

In Fig. 1, area *ABDEC*

$$= P(n-1) + 2.5Pn - 2.5P \\ = 3.5P(n-1) \dots (1)$$

And area *ABC* = $P(n-1)$

$$- 2.5P\left(1 - \frac{1}{n^{1.4}}\right) \dots (2)$$

Therefore, when combustion at constant pressure is continued to the end of the stroke, the thermal efficiency of the cycle is represented by:

$$\frac{P(n-1) - 2.5P\left(1 - \frac{1}{n^{1.4}}\right)}{3.5P(n-1)} \\ = \frac{1}{3.5} - \frac{\left(1 - \frac{1}{n^{1.4}}\right)}{1.4(n-1)} \dots \dots (3)$$

"Values of this quantity are given in Table II., where they are compared with values of $\left(1 - \frac{1}{n^{1.4}}\right)$, which represents for any value of *n* the thermal efficiency of the cycle, which includes combustion at constant volume. In the meanwhile it may be noted that the quantity (3) has a maximum value, for when *n* is infinite its limit is $\frac{1}{3.5} = .2857$, and therefore, under the assumed conditions, the ideal efficiency of the constant pressure cycle cannot exceed 28.57 per cent.

Following the analogy of the steam engine, improved economy may be looked for in an early cut off, as indicated in Fig. 2, where the point *B*, at which addition of heat ceases, is located so that the gas has expanded only to *m* volumes, *m* being some quantity less than *n*. Then, the pressures at *A* and *C* being equal to those of Fig. 1, we have:

$$\text{Temperature at } C = T = 290^\circ \text{ abs. Cent.}$$

$$\text{Temperature at } A = Tn^{1.4}$$

$$\text{Temperature at } B = Tm^{1.4}$$

Also:

Area *ABDFC*

$$= P(m-1) + 2.5Pm - 2.5P \\ = 3.5P(m-1)$$

And area *ABDC* = $P(m-1)$

$$+ 2.5Pm\left(1 - \left(\frac{m}{n}\right)^{1.4}\right) - 2.5\left(1 - \frac{1}{n^{1.4}}\right)$$

Therefore:

Efficiency =

$$\frac{(m-1) + 2.5m\left(1 - \left(\frac{m}{n}\right)^{1.4}\right) - 2.5\left(1 - \frac{1}{n^{1.4}}\right)}{3.5(m-1)} \dots \dots \dots (4)$$

$$= \frac{1}{3.5} + \frac{m\left(1 - \left(\frac{m}{n}\right)^{1.4}\right) - \left(1 - \frac{1}{n^{1.4}}\right)}{1.4(m-1)} \dots \dots \dots (5)$$

"Here *m* has two limits, 1 and *n*, and obviously when

$m = n$ the value of the expression (5) is the same as that of (3). If we assume the other limit and put $m = 1$ in Eq. (4), we arrive at the indeterminate fraction $\frac{0}{0}$, which may be evaluated in the ordinary way by differentiating both numerator and denominator and again substituting 1 for m .

Collecting the terms containing m in Eq. (4), we have

$$3.5 m - \frac{2.5 m^{1.4}}{n^4}$$

$$3.5 m$$

differentiating:

$$3.5 - \frac{3.5 m^{1.4}}{n^4}$$

$$3.5$$

and, putting 1 for m ,

$$\text{Efficiency} = \left(1 - \frac{1}{n^4} \right)$$

which, as might have been anticipated, is the efficiency at constant volume combustion. The efficiency of a constant pressure engine under the conditions of Fig. 2 is therefore improved by early cutoff, but only attains (for equal values of n) the efficiency of a constant volume engine when the power evolved falls to zero. For purposes of comparison the theoretical efficiencies are calculated for a constant pressure engine, assuming that addition of heat ceases at half-stroke; that is, when $m = \frac{n+1}{2}$, or $m-1 = \frac{n-1}{2}$. These figures

are embodied in Table II., which exhibits, therefore, the relative efficiencies at different values of n of (a) constant volume combustion, and (b) constant pressure combustion under the conditions shown by Figs. 1 and 2, the addition of heat ceasing at half-stroke in the latter case.

TABLE II

n	Thermal Efficiencies Per Cent		
	Constant Volume Engine	Constant Pressure Engine	Heat to End of Stroke
2	24.22	11.27	17.26
3	35.55	15.87	24.55
4	42.56	18.44	28.70
5	47.47	20.09	31.41
6	51.17	21.26	33.34
7	54.08	22.13	34.78
8	56.47	22.81	35.94
9	58.47	23.35	36.83
10	60.19	23.79	37.57

"These are not the ultimate ideal efficiencies for either cycle, but before proceeding further in search of Mr. Neilson's 84 per cent it will be well to pay some attention to conditions of temperature, in which connection the first obvious consideration is the mode of addition of heat, a matter which is not taken into account in the diagrams Figs. 1 and 2.

"Since we are dealing with ideal conditions we may imagine that in a constant pressure engine heat is added from a source of varying temperature, so that the temperature of the charge increases in proportion to the volume, and under these conditions the mean temperature in the cylinder during addition of heat will be the mean of Tn^4 and $Tn^{1.4}$, or the mean of Tn^4 and Tmn^4 , according as the conditions are those of Fig. 1 or Fig. 2. Addition of heat in this manner can, however, scarcely be considered practicable, since each particle of

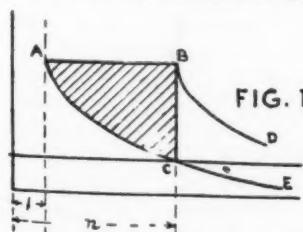


FIG. 1

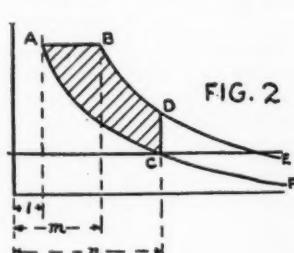


FIG. 2

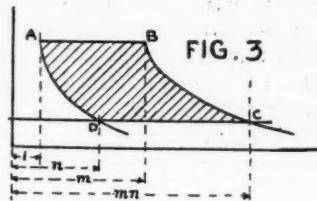


FIG. 3

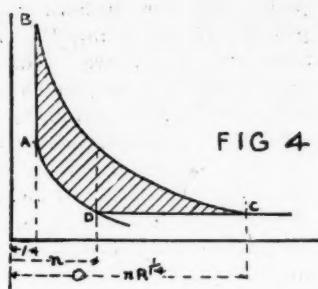


FIG. 4

charge entering the cylinder is assumed to carry with it its own supply of combustible, and we must, therefore, consider alternatively that the temperature in the cylinder during addition of heat is constant, and is Tn^4 or Tmn^4 , as above. This condition is described in Tables III. and IV. as 'practical'; that is, relatively practical as compared with the 'ideal' assumption of a source of heat of varying temperature.

"In comparing the mean temperatures during the working stroke in constant volume and constant pressure engines, it may be found under certain circumstances that for the same consumption the mean temperature of the constant volume engine is the higher. But its power for the same consumption will also be higher, and I have therefore introduced in Tables III. and IV. a column showing the mean temperature at constant volume combustion when the powers are equal. This necessitates the assumption of a lower temperature of explosion at equal powers than at equal consumption, and this assumption is made throughout these two tables, the heating value of the charge being taken as proportional to the value of n . It will be understood, of course, that the tables are merely illustrative.

"In adiabatic expansion the mean temperature during expansion to n volume is:

$$\frac{\int_n^1 CV^{-4} dV}{V-1} = \frac{C(n^6 - 1)}{.6(n-1)} \quad \dots \quad (6)$$

which expression is used in calculating the mean temperature during expansion in the constant volume engine, and also in the latter half of the stroke in the constant pressure engine illustrated by Fig. 2; noting in the latter case that the n of Eq. (6) becomes $\frac{n}{m}$, the expansion ratio, and C becomes Cm .

In Fig. 1 the increase of temperature between A and B is Tn^4 ($n-1$), therefore on combustion of the same charge at constant volume the increase of temperature would be 1.4 Tn^4 ($n-1$), and the temperature of explosion would be Tn^4 (1.4 $n-1$). The temperature of explosion in the case of equal powers is, therefore,

$$Tn^4 \left\{ 1.4(n-1) \left(\frac{\text{efficiency at const. press.}}{\text{efficiency at const. vol.}} \right) + 1 \right\}$$

a similar calculation being made in the case of Fig. 2.

TABLE III

Mean temperatures during working stroke, when heat is added in constant pressure engine throughout stroke.

n	Constant Volume		Constant Pressure	
	Equal Consumption	Equal Powers	Ideal	Practical
2	890	544	574	765
3	1,330	787	900	1,350
4	1,892	1,027	1,262	2,019
5	2,452	1,203	1,656	2,761

TABLE IV

Mean temperatures—addition of heat ceasing at half stroke.

n	Constant Volume		Constant Pressure	
	Equal Consumption	Equal Powers	Ideal	Practical
2	559	493	503	551
3	840	688	751	864
4	1,128	880	1,012	1,202
5	1,422	1,022	1,294	1,570

The comparison between the constant pressure engine and one operating on the Otto cycle should properly cease at this

point, but our authors claim additional economy by the process of expanding the products of combustion down to atmospheric pressure. This operation is by no means wholly impossible, and has, in point of fact, been carried out in a modified form by Atkinson and a few others, and precisely with the additional economy which might have been anticipated. The system in its complete form involves the use of cylinders much too large for automobile work, but it is theoretically interesting, and it is here, if anywhere, that a sanguine investigator might hope to re-discover Mr. Neilson's marvel.

"Fig. 3 represents the final possibilities of the constant pressure engine. The volume of the charge is n , which as before, becomes one volume at A , and has then a temperature of Tn^4 and a pressure of pn^4 . By addition of heat this volume becomes m volumes at the point B , the value of m being such that $m = \frac{C}{Tn^4} + 1$, where C is a constant representing the heating value of the mixture. For present purposes I assume $m = 1,428$, which represents a mixture capable of adding 2,000 deg. C. on explosion at constant volume. This value is adhered to throughout what follows.

From B the products of combustion are assumed to expand to atmospheric pressure at the point C , where they have the volume mn . The atmospheric line completes the power diagram.

In this diagram the area $ABCD$ is equal to:

$$\begin{aligned} P(m-1) + 2.5 Pm \left(1 - \frac{1}{n^4} \right) \\ - 2.5 P \left(1 - \frac{1}{n^4} \right) - \frac{P}{n^4} (m-1) \\ = 3.5 P(m-1) \left(1 - \frac{1}{n^4} \right) \end{aligned}$$

and, since the heat added is, as shown in connection with Fig. 2, $3.5 P(m-1)$, we have

$$\begin{aligned} \text{Efficiency} = \frac{3.5 P(m-1) \left(1 - \frac{1}{n^4} \right)}{3.5 P(m-1)} \\ = \left(1 - \frac{1}{n^4} \right) \end{aligned}$$

which is precisely the efficiency of the ordinary Otto cycle with expansion only to n volumes, as given in the first column of Table II.

"Table V. exhibits some of the principal figures relating to Fig. 3, and includes for comparison the mean temperature during the working stroke of an engine on the Otto cycle expanding to n volumes only.

"As already indicated, it cannot be admitted that the con-

TABLE V
Constant pressure engine—expanding to atmosphere

n	m	Volume Swept by Piston	Maximum Pressure	Maximum Temperature	Mean Temperature	Mean Otto to n Vols.	Efficiency
4.73	8.46	38.79	1,811	1,669	2,049	24.22%	
4.17	11.51	68.42	1,878	1,575	1,905	35.55%	
3.83	14.32	102.30	1,933	1,502	1,807	42.56%	
3.59	16.95	139.90	1,980	1,439	1,729	47.47%	

stant pressure engine has any monopoly in the matter of expansion to atmospheric pressure. The arrangement is equally practicable, or equally impracticable, as you choose to consider it, in the case of the engine where combustion takes place at constant volume. Fig. 4 relates to such an engine using a mixture of the same heating value as that of Fig. 3,

and, in this case, if we put $\left(\frac{2,000}{Tn^4} + 1 \right) = R$, the expansion

curve coincides with the atmospheric line at $nR^{\frac{1}{4}}$ volumes.

"The efficiency of such an engine is represented by the fraction:

$$\begin{aligned} 2.5 PR \left(1 - \frac{1}{n^4 R^{\frac{1}{4}}} \right) - 2.5 P \left(1 - \frac{1}{n^4} \right) - pn \left(R^{\frac{1}{4}} - 1 \right) \\ \hline 2.5 P (R - 1) \\ R \left(1 - \frac{1}{n^4 R^{\frac{1}{4}}} \right) - \left(1 - \frac{1}{n^4} \right) - \frac{1}{n^4} \left(R^{\frac{1}{4}} - 1 \right) \\ = \hline (R - 1) \\ = 1 - \frac{1.4 (R^{\frac{1}{4}} - 1)}{n^4 (R - 1)} \dots \dots \dots \quad (7) \end{aligned}$$

"Temperature are calculated by the methods already used. Results similar to those of Table V. are embodied in the following table:

TABLE VI
Otto cycle—with additional expansion to atmosphere

n	R	Volume Swept by Piston	Maximum Pressure	Maximum Temperature	Mean Temperature	Efficiency
4	6.222	6.38	241.3	2,383	1,442	45.34%
4	5.444	9.07	372.5	2,450	1,349	52.22%
4	4.960	11.49	507.4	2,505	1,295	56.65%
5	4.623	13.92	646.9	2,552	1,241	59.70%

"For further convenience of comparison these figures are arranged in Table VII. so as to indicate more conveniently the relative temperatures, pressures, and cylinder dimensions in (a) the ordinary Otto cycle with expansion to n volumes,

(b) the Otto cycle with additional expansion to $nR^{\frac{1}{4}}$ volumes, and (c) the constant pressure cycle with expansion to mn volumes. The value of n is taken at the convenient figure of 4 in each case, and as a mixture of the same heating value is assumed in each case, the powers will be directly proportional to the efficiencies. It will, I think, be admitted that the figures do not support the somewhat peculiarly sanguine conclusion of Messrs. Browne and Chase.

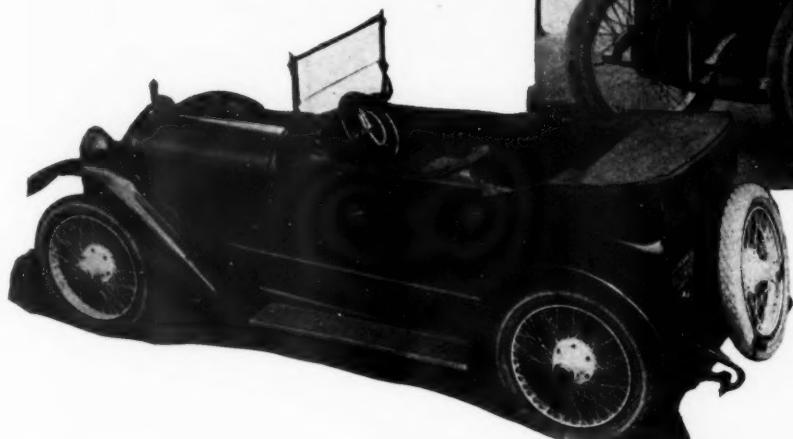
TABLE VII

	(a) Ordinary Otto	(b) Expanded Otto	(c) Constant Pressure
Volume swept by piston	3.00	11.49	14.32
Maximum temperature	2,505	2,505	1,933
Mean temperature	1,807	1,295	1,502
Maximum pressure	507.40	507.40	102.30
Efficiency, per cent.	42.56	56.65	42.56

"The first point obvious here is the enormous cylinders required by the constant pressure engine. Without any gain in power or economy over the ordinary Otto cycle engine the volume would have to be increased from 3000 c.c. to 14,320 c.c. This appears prohibitive, but even if large cylinders were admissible for the sake of economy the choice would certainly lie with the expanded Otto, which, with a volume of 11,490 c.c., would, on the same consumption, give power in the proportion of 56.65 to 42.56 provided by the constant pressure engine, and with a lower mean temperature.

"The constant pressure engine apparently scores in the matter of maximum pressure, but the advantage is to a large extent merely apparent, for it is unlikely that two cylinders of 3.00 and 14.32 volumes respectively would be designed with the same bore. It will also be noted that the vaunted flexibility of the constant pressure engine exists only in the imagination of its advocates; the methods available for altering its power output are simply those used in a constant volume engine with a fixed spark; that is, altering the quantity and the quality of the mixture."

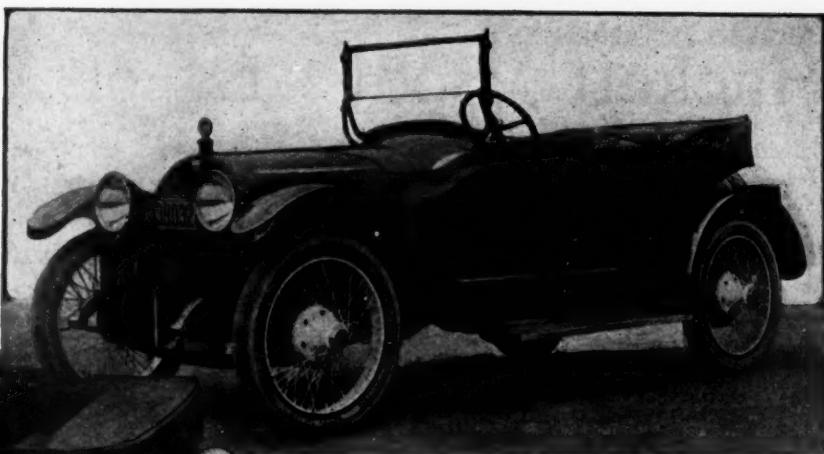
Haynes Roadster for Four Passengers



DELIVERIES have been going on since early in August on a new four-passenger Haynes roadster which is mounted on either the twelve or six chassis. The new car is a successor to the Haynes three-passenger So-Sha-Belle model, and although it has a greater capacity, it resembles the former model to a great extent in body lines.

The front seats of the four-passenger roadster are divided and the aisleway between them affords easy passage to the tonneau. The rear seat is wide enough for two passengers, and, when circumstances require, it will accommodate three persons. The rear passengers are given an extra amount of leg room by sloping the backs of the front seats downward toward the brake and clutch pedals. The seats and the sides of the tonneau are upholstered in hand-buffed leather which in turn is covered by gray water-proof seat covers of soft cloth. The body is low and the running boards have a ground clearance of 10 in.

Special attention has been given the comfort of the driver in that the pedal pads may be brought to the desired position and the seat moved forward or backward. By grouping all the cowl instruments on a compact board the controls are moved up within easy reach. The 18-in. steering wheel is heavily notched and highly polished, so that it has an easy grip and good leverage. The accelerator pedal requires a minimum amount of effort, as it moves in a vertical direction and no vibration is transmitted to the arms of the driver since the steering column is mounted in the cowl apron.

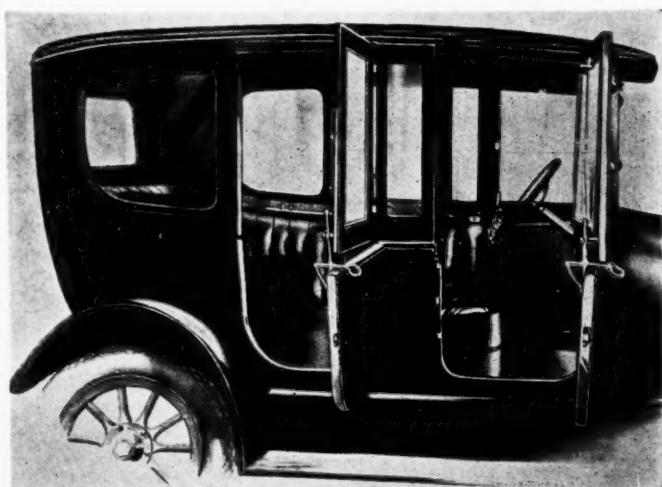


New four-passenger roadster mounted on
Haynes six or twelve

Jackson I-Head Eight

AN eight-cylinder car with a valve-in-head engine has been added by the Jackson Automobile Co. The new model will be made up with four body styles, a five-passenger touring and a two-passenger roadster at \$1,295, a four-passenger body with divided front seats and sloping rear deck at \$1,395 and a seven-passenger touring at \$1,370. The two eights and the four, which are now on the market, will be continued without change.

The only difference between this car and other Jacksons is in the power plant as the specifications of the new model include all the features of the others, such as full elliptic springs front and rear. It is stated that the new engine will develop 48 hp. It has a bore of 3 and a stroke of 3½ in. and is fitted with a Zenith duplex carburetor, Stewart vacuum feed, Auto-Lite starting and lighting, Remy ignition, 34 by 4 in. tires and has a 118-in. wheelbase. One of the bodies mounted on the new model is illustrated below.



Body suitable for town or country use
mounted on the eight-cylinder, valve-in-head Jackson just added to the line.
The two eights and the four previously
manufactured will be continued

Hackett Body Is of Striking Design

Straight-Line Effect Characterizes New Four-Cylinder Touring Car—3 3/4 by 4 1/4-In. Engine—A Three-Passenger Roadster, a Cabriolet and a Demountable Top

A FOUR-CYLINDER, five-passenger car at \$888, with distinctive straight-line body and low, comfortable seats, is the initial offering of the new Hackett Motor Car Co., Jackson, Mich., formerly the Argo Motor Co.

The body design is original, a straight line running from the top corners of the radiator all the way back. The effect is accentuated by the use of a narrow deck extending all around the rim of the body, and also forming the double cowl on the back of the front seat. The straight-line idea is still further emphasized by the fact that the seats are low. The windshield is tilted and there are large louvres in the hood at the same angle.

A Three-Passenger Roadster

In addition there will be a runabout, at the same price, seating three, with the driver's seat slightly ahead of the other two, a cabriolet for about \$1,000 and a winter top for the five-passenger at \$110 additional.

The chassis is standard with a unit power plant consisting of a 37-hp. engine, G. B. & S. clutch, Grant-Lees gearbox and Walker-Weiss axles.

Detachable Cylinder Head

The engine is a detachable L-head design with cylinders in block and crankcase in two pieces, the lower part being made of pressed steel and acting as an oil pan. Bore and stroke are 3 3/4 by 4 1/4 in., giving a formula rating of 22.5, and a piston displacement of 188.2 cu. in. It gives this rating at a piston speed of 935 ft. per min., instead of 1000, and produces its maximum of 36.9 hp. at 2000 r.p.m.

The crankshaft is 35 to 45 point carbon steel, drop-forged and heat-treated, and has three main bearings. The front bearing is 1 1/2 by 3 1/2 in., the center, 1 1/2 by 2 1/4 in., and the rear, 1 1/2 by 2 in. Connecting-rod bearings are 1 1/2 by 2 in. Bearings are babbitt, reinforced with perforated steel shells.

Force Feed and Splash Oiling

Lubrication is by combined force feed and splash. Oil is drawn from the reservoir by a plunger pump which is operated by No. 4 exhaust cam, passes through a sight feed on the cowl and from thence to the three main bearings. The over-

flow from the bearings makes its way to the splash troughs into which the connecting-rods dip. The oiling system is extremely accessible, as the pump and all the piping are on the exterior of the engine.

Valve Adjustments on Stems

The valves are unusual in that the adjusting nuts are on the stems instead of the push rods, and consequently act as spring retainers. The end of the stem is threaded and on it is placed a thimble nut which is held solid by a lock nut. The valves consist of cast iron heads welded on 3/8-in. carbon steel stems. The lift is 7/32 and the clear opening 1 1/8 in. The valve stem guides are bushed with 3 3/16 cast iron sleeves.

Camshaft and Disco motor-generator drive are by silent chains, adjustment of the latter chain being accomplished by rocking the bracket on which the unit is carried.

Ignition is furnished by a Remy coil and distributor, mounted at the front and driven off the camshaft.

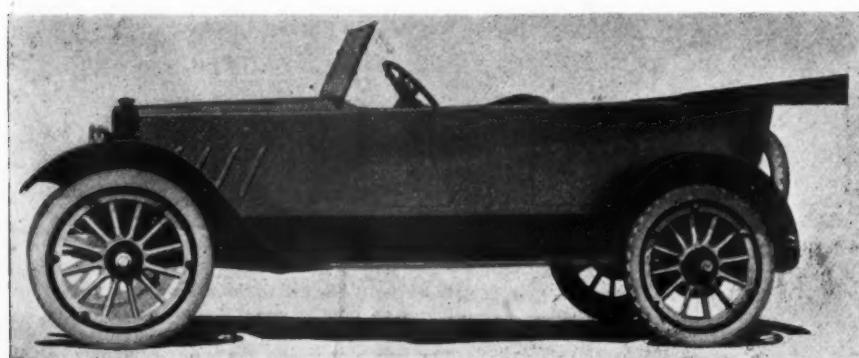
Stewart Vacuum Fuel Feed

The fuel system consists of a tank at the rear from which gasoline is drawn by a Stewart vacuum system to the carburetor, which is a Justrite, a single jet design in which the correct proportion of air and gasoline is obtained by varying the size of the venturi passage.

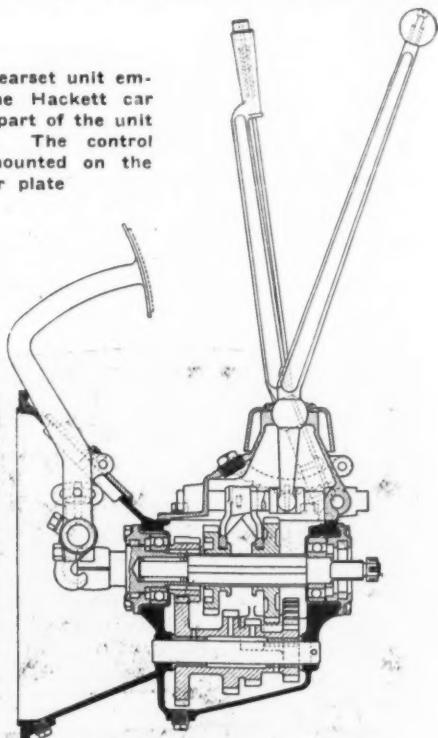
Cooling is by thermo-syphon, a cellular radiator and a four-blade fan being used with it.

Clutch Runs in Oil

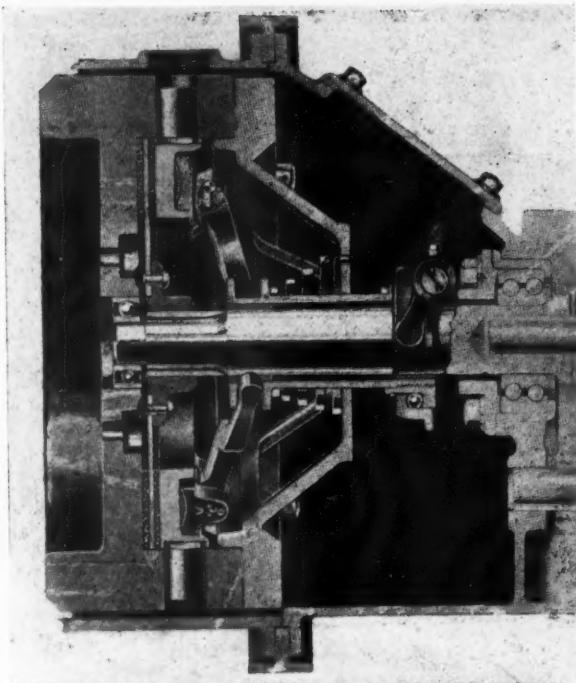
The G. B. & S. clutch is housed in the flywheel and has a single driven disk of steel. A ring of wire-woven asbestos



Straight-line car manufactured by the Hackett Motor Car Co., Jackson, Mich., selling for \$888. This is fitted with a winter top for \$110 additional. This car and the three-passenger roadster are mounted on a 112-in. wheelbase chassis.



Grant-Lees gearset unit employed on the Hackett car and forming part of the unit power plant. The control levers are mounted on the cover plate



Section through the clutch unit on the Hackett car, showing yoke and spring mounting

fabric bears against either face. Smooth action and reduced wear are obtained by running the clutch in oil. It is so designed that no adjustment is required.

The gearbox gives three speeds forward. The gears are 3½ per cent nickel steel. The main shaft is carried on annular ball bearings and the countershaft gears are in one piece, are bushed and are free to rotate on the stationary shaft.

The clutch and gearset are accessible and may be removed quickly and easily without disturbing the engine, which is supported at the rear by arms attached to the flywheel housing. The gearbox bolts to the bell housing.

Semi-Floating Axle

The rear axle is a semi-floating Walker-Weiss with chrome-nickel driving shafts, open hearth ring gear and 3½ per cent nickel pinion. There are two sets of brakes operating on the one set of drums. The front axle is an I-beam design, and steering is by worm and gear. Half-elliptic springs are used in front, 36 by 1½ and three-quarter elliptic in the rear, 48 by 1½ in. Wheelbase is 112 in., and the Ajax tires are 32 by 3½, with demountable rims.

The car will be finished in Packard blue with ivory white wheels, and the upholstery will be French pleated.

Control pedals and levers are conveniently placed and the steering wheel is 17 in. in diameter. Cowlboard equipment is complete, including speedometer, oil gage, gasoline choke lever, lighting switches, ammeter and instrument light with metal trimmings heavily nickelated.

Landau-Farr Lubricating Bolt Now on the Market

DAVID LANDAU and H. G. Farr, well known in the automobile trade as spring engineer and chief engineer of the Knox company respectively, have combined their experience in the production of an automatic lubricating bolt. This is to be marketed by the Brown company, Syracuse, N. Y., which has taken an exclusive license.

While this bolt is new to the trade, it has really been in existence for about 3 years and was first shown on a car at the 1913 Madison Square Garden show. It is intended for a spring shackle bolt but can be used in principle in other mechanisms requiring a continuous feed of fluid oil for internal lubrication.

Felt Wick for Oiling

The lubricating features consist of a main reservoir with a felt wick that is positively attached to a threaded cap plug and one or more feed or filter wicks. The reservoir felt when in position in the hollow shackle bolt is under a slight amount of compression, forcing all the surfaces of the felt against the interior of the bolt. The feed and filter wicks rest against the main reservoir wick and carry the oil to the bearing by capillary attraction. The reservoir wick fits tightly into the hollow bolt and thus forms an efficient oil pump when filling the reservoir. The cap plug forms a handle for operating the wick which can be pulled back in the same way as a plunger.

Operation of the Bolt

In operating the bolt the reservoir plug is removed and the oil put in with an oil gun or squirt can. The wick is then inserted and worked back and forth like a pump plunger and enough pressure can be generated to force the oil through the cross wicks which can be seen in the illustration and out through the ends of the spring bearings. The wick in this manner becomes saturated with oil and when the wick plug is screwed in place against the bolt head the reservoir wick is put under compression and automatic lubrication starts and continues until the main wick is exhausted.

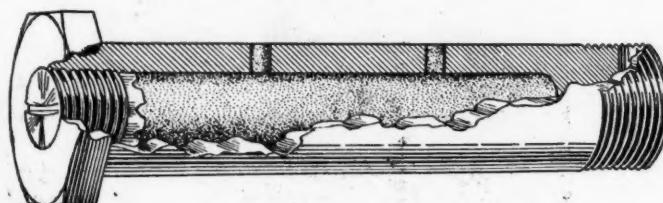
The manufacturers state that about 1200 of this type of

bolt were fitted to a series of heavy cars weighing 5100 lb. empty, in 1913. After running from 28,000 to 52,000 miles thirty of these bolts were removed and the wear from them was found to be 0.009 in. as a maximum and 0.002 as a minimum. Sample bolts have already been placed in 1917 cars.

Concealing the Spare Tire

EXPERIENCED motorists who have plenty of mechanical knowledge but no active engineering work to their credit, are constantly expressing surprise that no means has yet been discovered for inclosing the spare tire and rim or spare wheel except on runabout designs with rear decks. They point out that the usual spare tire mounting is a disfigurement to the fine body lines now the rule, and they say they cannot see the difficulty in providing a compartment somewhere at the back of the body, where the spare could be stowed.

Probably nearly every designer has had a good long look at the problem and been unable to discover a way out, but it may be doubted if the matter has ever been studied as carefully as it might have been. To look at a few dimensions, the average back seat cushion is well over 40 in. wide, and few tires exceed an actual 36 in. diameter. The rounded back is coming into favor; in fact, there will be some cars at the 1917 shows with rear ends to the bodies almost hemispherical. Studying these new styles there seems no obvious answer to the question "Why is the spare tire never inclosed?"



Part section through the Landau-Farr shackle bolt, showing main wick and side feed wicks.

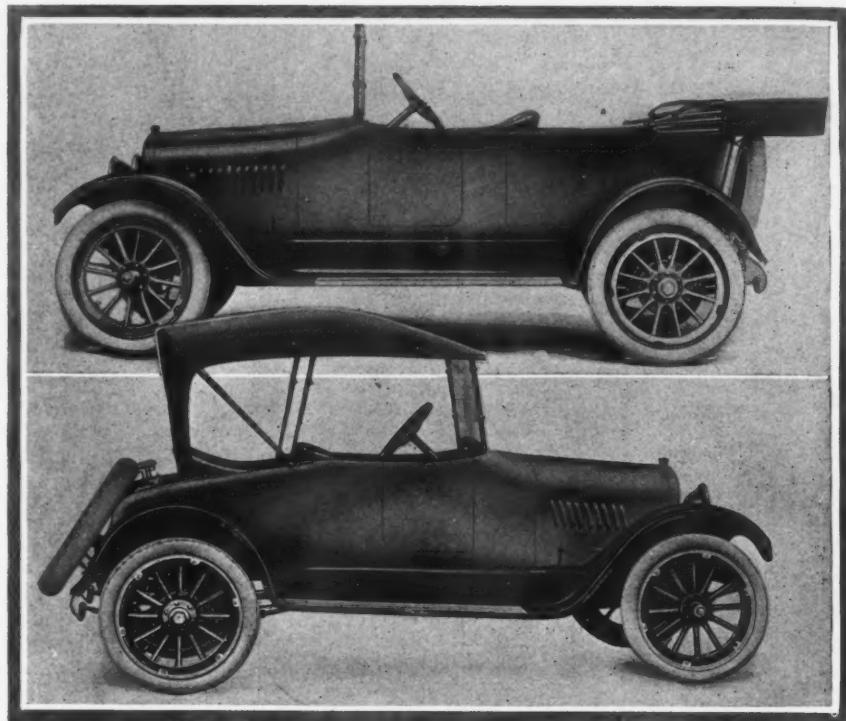
Details
of the 1917 Dixie
Line



Above—Three-quarter plan view of the new four-passenger roadster, showing how the roadster lines are maintained with full four-passenger seating capacity

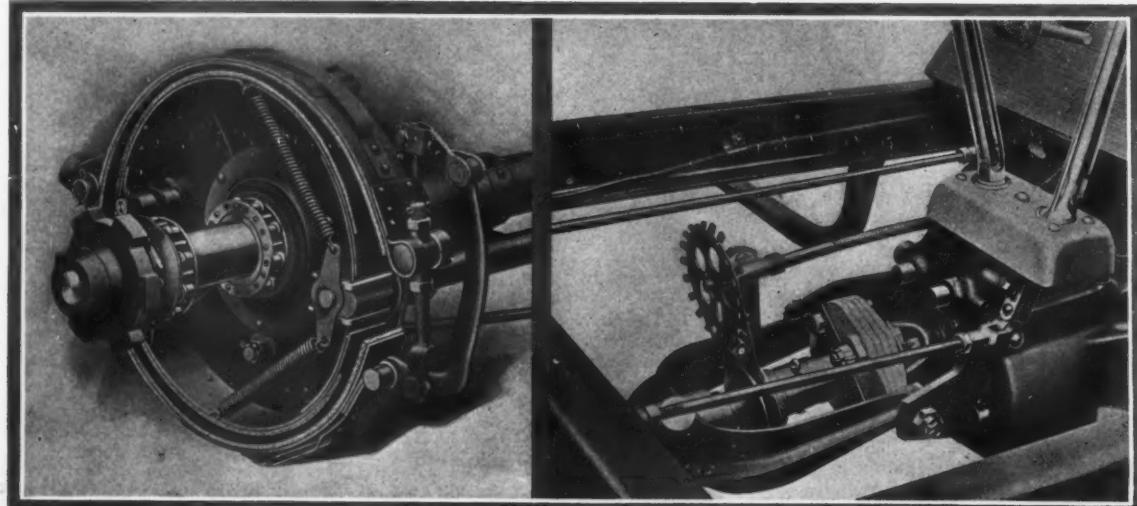
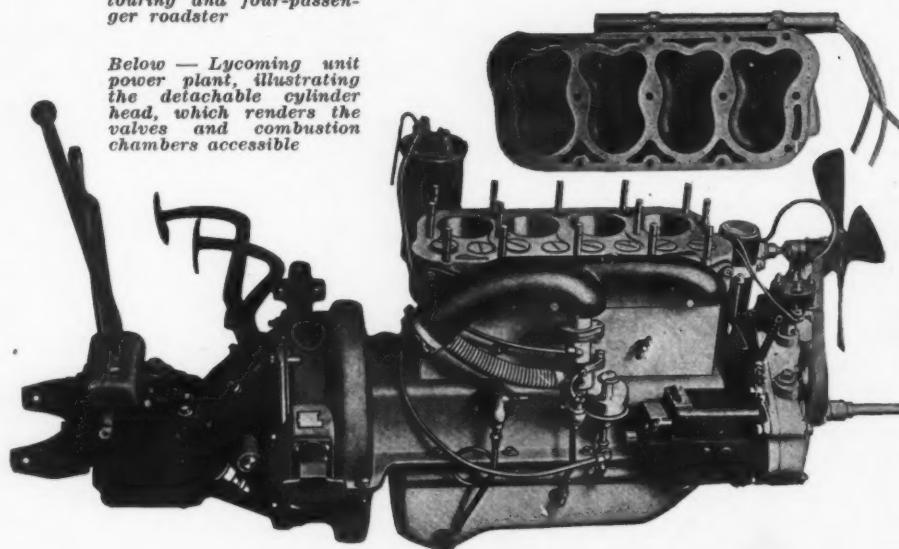
Lower left—Wheel removed, showing the bearing mounting and the assembly of the brake bands

Lower right—Flexible universal and speedometer mounting just back of the gearset, also shows connection at the front of the torque tube



Above — Five-passenger touring and four-passenger roadster

Below — Lycoming unit power plant, illustrating the detachable cylinder head, which renders the valves and combustion chambers accessible



Dixie Flyer Battery Mounting Sole Change

Current Source Removed from Motor Vibration—
Line Comprises Five-Passenger Touring and Four-Passenger Roadster with Lycoming Engined Chassis

VERY little change has been made in the four-cylinder 1917 Dixie Flyer cars which are now going through production. All the alterations are only detail refinements, with the exception of battery location. In the 1916 chassis the battery occupied the conventional location under the floorboards close to the motor supporting arm. For 1917 it is placed on the left side of the main frame well forward. The reason for this change is that considerable disadvantage was found resulting from the vibration of the engine, and the heat. In the present position the battery is free from heat and vibration and is now so arranged that raising the hood exposes every connection to the eye and allows of considerably shorter lead wires to the starting motor.

Lycoming Power Plant

The power plant consists of a Lycoming engine. This has not been changed and is a four-cylinder $3\frac{1}{4}$ by 5, L-head design with an S. A. E. rating of 16.9 and, according to the manufacturers, develops 29 hp. at 1900 r.p.m. The cylinders are cast in a block and are of gray iron with the water inlet at the bottom of the casting on the opposite side from the valves. A feature of the motor block is the reinforcement of the attaching flanges where it is bolted to the crankcase, giving maximum rigidity with a minimum of vibration. The head is cast separately allowing space for large valves and also permitting of machining of the cylinders and giving access to the cylinders and valves. The head is also reinforced with ribs preventing warping during machining and permitting a perfect joint between the head and cylinders. Tightness is secured by a copper-asbestos gasket.

The pistons are close-grained iron centered from the inside to secure even thickness of wall. Three piston rings are used, these being eccentric and ground on three sides. The piston pin is hollow of case-hardened steel with a scleroscope test for hardness. The pin is held tight in the piston with the upper end of the connecting-rod forming the bearing through a bronze bushing.

Drop-forged I-beam connecting-rods of 40 carbon steel are used with split type lower ends having a diameter of $1\frac{1}{8}$ in. and a length of $2\frac{3}{8}$ in. on the bearing. The cap is retained by two nickel-steel bolts.

A drop forging is also used for the crankshaft. It is 40-50 carbon steel supported on two bearings. The front is $1\frac{1}{8}$ in. diameter by $3\frac{1}{4}$ in. long and the rear $1\frac{1}{8}$ in. diameter by $3\frac{15}{16}$ in. long. The flywheel is bolted to a flange on the rear end of the crankshaft, this flange being forged integral and the whole assembly placed in running balance. The bearings are split die cast white metal, adjustable by removing brass shims.

Carbon Steel Camshaft

Low carbon steel is used for the camshaft which is 1 in. in diameter and supported on three bearings. Dimensions of these from front to rear are $1\frac{1}{4}$ in. diameter by $2\frac{15}{16}$ in. length, $1\frac{55}{64}$ by $\frac{3}{8}$ in. and 1 in. by $2\frac{9}{16}$ diameter and length respectively. Scleroscope tests for hardness are used on the cams and each is tested on a special jig for eccentricity.

Helical timing gears are employed to drive the camshaft

and other auxiliaries. The camshaft gear is of cast-iron meshing with the steel crankshaft gear. The gears are marked for mesh so that after taking down the engine, re-timing is simple. The remainder of the valve action is through flat head pushrods also case-hardened and the valves themselves have gray iron heads fused on steel stems. They are $1\frac{1}{8}$ in. in diameter and located on the right side of the engine, so that the steering column does not interfere with valve adjustments.

Lubrication is worked out along the lines of the conventional combination pressure and splash system. The oil is contained in the bottom half of the crankcase which has a capacity of 5 qt. A plunger pump circulates the oil, this being driven by an eccentric on a camshaft. The oil is carried to leads which supply the crankshaft and also the troughs beneath each connecting-rod throw. There is an oil scoop on the bottom of each of the rods, which, due to the design of the oil pan, dips an equal depth regardless of grade and road conditions.

Cooling is by a thermo-syphon system which has several distinctive features. It will be noted from the illustrations that the radiator is on the frame instead of between the frame members, thus placing the lowest level of the cooling water in the radiator above the cylinder jackets, allowing circulation to commence as soon as the engine is started. The inlet and outlet pipes are both extra large, with the radiator being connected to the engine by $2\frac{1}{4}$ in. hose. Additional efficiency in cooling is secured by having each cylinder barrel independent from its neighbor, thus permitting the free circulation of water all around and between the cylinder walls. Extra large waterways are also provided around the valves.

Stewart Vacuum Feed

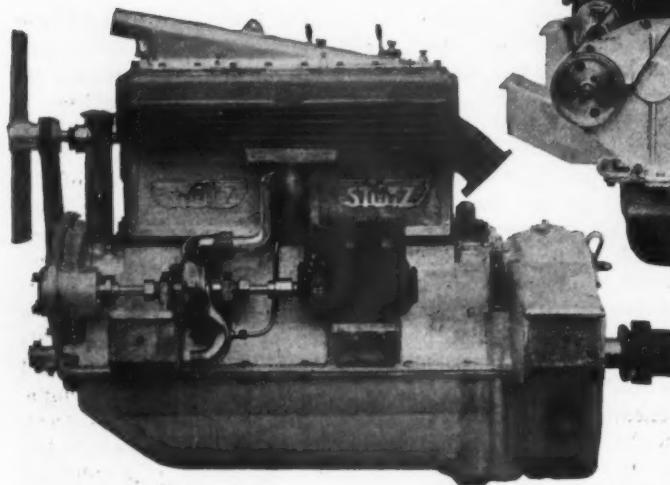
The gasoline system comprises a cylindrical gasoline tank, hung at the rear of the chassis, a Stewart vacuum feed and a Carter carburetor, with special adjustment on the instrument board. There is an arrangement for holding a reserve of 1 to 3 gal. in the supply tank and for automatically notifying the driver when the reserve is reached. A 2-in. section of the gas supply pipe works perpendicularly through a specially packed sleeve in the connection at the top of the tank. A stop is provided on the lower section of the pipe inside the tank to limit its travel upward. When the supply pipe is drawn up to the top the vacuum feed draws gas from a point 2 in. above the bottom of the tank. Should the car at some out-of-the-way place run out of fuel, it is only necessary to push down the feed pipe to secure additional feed.

The clutch is a cone of pressed steel with leather facing and with six compensating spring plungers under the leather to secure easy engagement. A straight line drive is secured by underslinging the rear springs and inclining the motor in the chassis, so that when the car is underloaded the drive does not deviate greatly from the straight line. From the clutch the drive is taken through a Grant-Lees standard gearbox with a semi-steel case having a strength of 28,000 lb. per sq. in. tensile. The main shaft has four splines and is of 90,000 lb. steel with a 75 to 80 scleroscope test. It is carried

(Concluded on page 363)

Sixteen-Valve Stutz Roadster Ready

Multi-Valves for High Volumetric Efficiency



FOR some time it has been predicted that the tendency observed in racing toward multi-valve cylinders would find its reflection in vehicles intended for ordinary use. The Stutz company bears out this prediction in announcing a sixteen-valve four-cylinder motor placed in a roadster intended for high speed work.

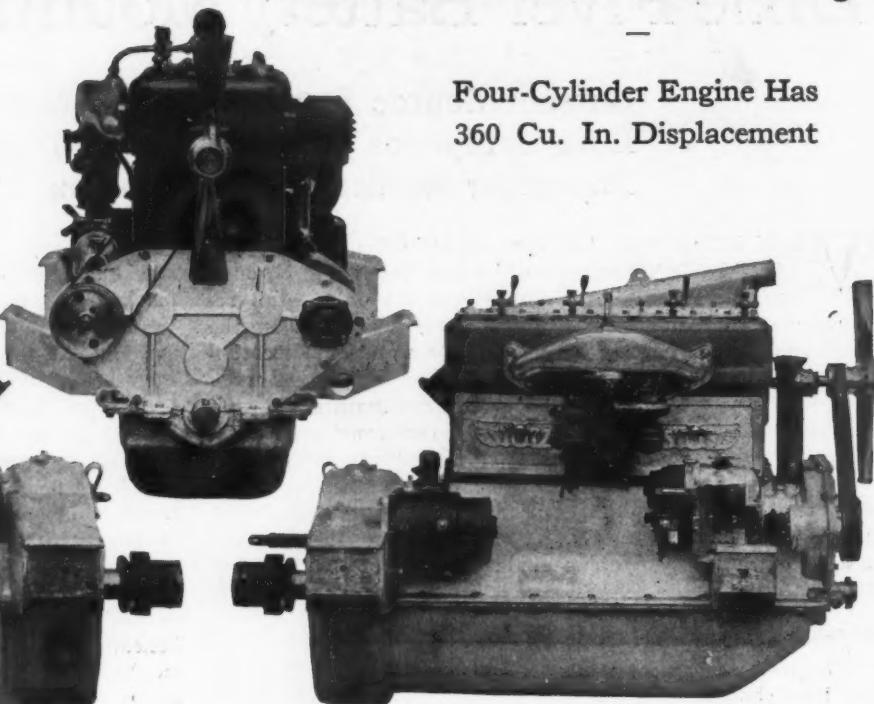
High volumetric efficiency is naturally the object in the greater number of valves per cylinder and the gain is not noticeable except when the ratio of piston speed to displacement becomes such as to require exceptionally high gas speeds. Therefore, in order for an engine of this type to be of use to the average individual who does not expect to travel over the highways at 90 m.p.h., we would expect a powerplant with large cylinders. This is the case in this new Stutz job which has a displacement of 360.8 cu. in. with its bore of 4 $\frac{1}{2}$ and stroke of 6. This gives a formula rating of 30.63 hp. based on the 1000 ft. per minute piston speed. As the engine is intended for high speed work this rating is exceeded to a very large extent. The cylinders are cast in a single block which is a departure from usual Stutz practice. In spite of the compactness of the casting extra large water spaces surround each cylinder and the exhaust ports are all separated, having eight separate entrances into the manifold.

Aluminum alloy is used for the crankcase and this casting is arranged so that the front leg incorporates the breather. This feature has been so arranged to prevent the accumulation of oil vapor over the exterior of the engine, thereby cutting down the collection of dust. The bolts holding the main bearings in place are through bolts with a collar countersunk into the crankcase. They also hold the cylinders in place.

Nickel steel is used for the crankshaft which is supported on three extra long main bearings. In mounting these, the bearing seats as well as the bearings themselves are carefully scraped in so that a solid backing is given the shaft supports. The valves are all operated by roller lifts from the camshaft.

Lubrication is by pressure feed through a hollow crankshaft. Oil is pumped from the reservoir in the crankcase through a main duct cast integral with the crankcase to independent ducts leading to each crankshaft bearing. The

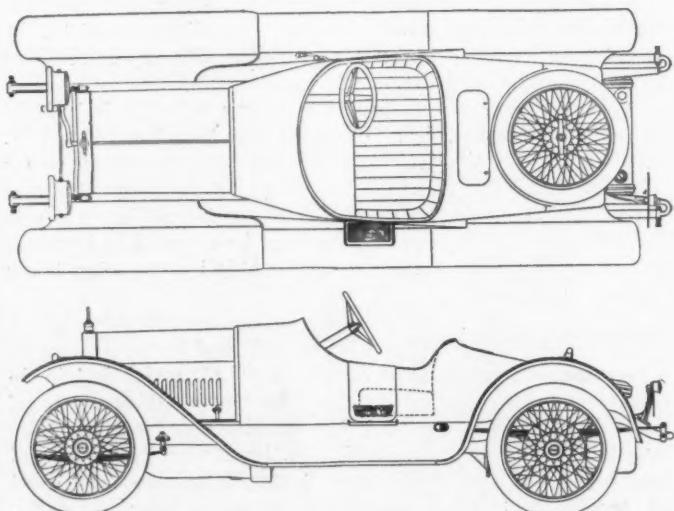
Four-Cylinder Engine Has 360 Cu. In. Displacement



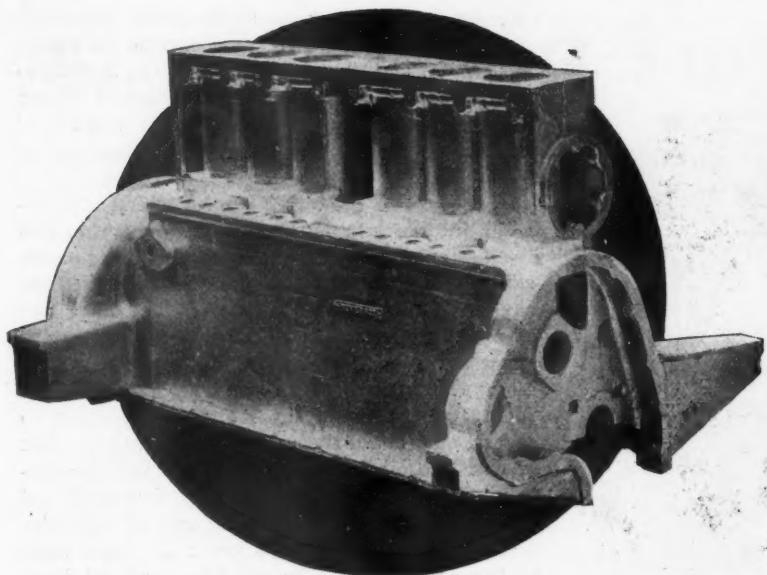
stream of oil then passes through the hollow shaft to the lower rod bearings which are fed by a constant flow. The pistons are lubricated from the main and rod bearings, the oil filler is incorporated with the fan bracket and a gage is provided on the side of the crankcase showing the amount of oil in the reservoir.

The fan is a two-blade aeroplane type of an aluminum alloy mounted on an annular ball bearing with an eccentric bearing for adjusting the tension of the fan belt. The intake manifold which is water jacketed is so designed that the carburetor is very close to the cylinder ports and very accessible. Hot air is taken directly from the exhaust manifold by a hot air tube extending between the middle two cylinders.

This engine has been in a car for some time and driven several thousand miles. The particular car in which it was installed for trial was a four-passenger job which the makers state has been driven up to 75 m.p.h. fully equipped with the top and windshield up and carrying four passengers. On the same adjustment good fuel economy was secured.



Plan and elevation of the sixteen-valve Stutz roadster



The Premier aluminum engine block

WHEN the Premier Motor Corp. announced this spring that the product of its new factory would be a six-cylinder car with an aluminum engine and magnetic gearshift considerable interest was felt throughout the trade. Now that the full description of the car is available it is seen that the general layout is in every way as modern as the early announcements showed to be the case in these particular details. The new Premier is an entirely separate organization from the old Premier, with a new engineering, production and sales staff and a new factory with new machinery.

A glance at the exterior will show this to be an entirely new car and while unlike anything now on the market it is in many respects a composite of the low-resistance lines of the up-to-date car. From the V-radiator to the rounded stern the entire body gives a suggestion of small resistance and yet roominess. The latter quality is secured to a large extent by the fact that the underhood space that is generally lost to the fan has been utilized for the engine by placing the fan well up in the V-shaped radiator, thus securing so much more room for driver and passengers.

According to present plans between 500 and 1000 of the new cars will be produced during the latter part of this fall. The factory is ample for 20,000 per year production, having an area of 327,000 sq. ft. of floorspace, a complete overhead conveyor system and a plant which is noticeable for its lighting. The buildings and grounds, which cover an area of 40 acres, are in every way suited for the installation of chain or other modern production systems.

Two Bodies at Present

For the present, the line will comprise a seven-passenger touring and a four-passenger roadster selling for \$1,685. The principal specifications include the 43% by

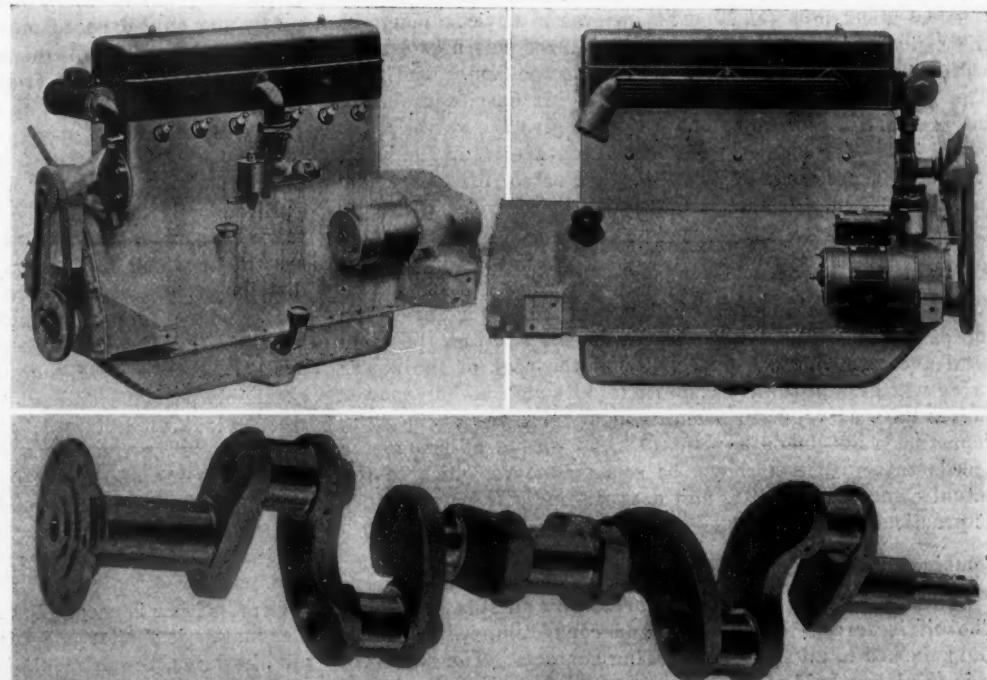
Aluminum Block Engine in New Premier

Two Body Models for the Present — Cutler-Hammer Electric Gearshift Standard

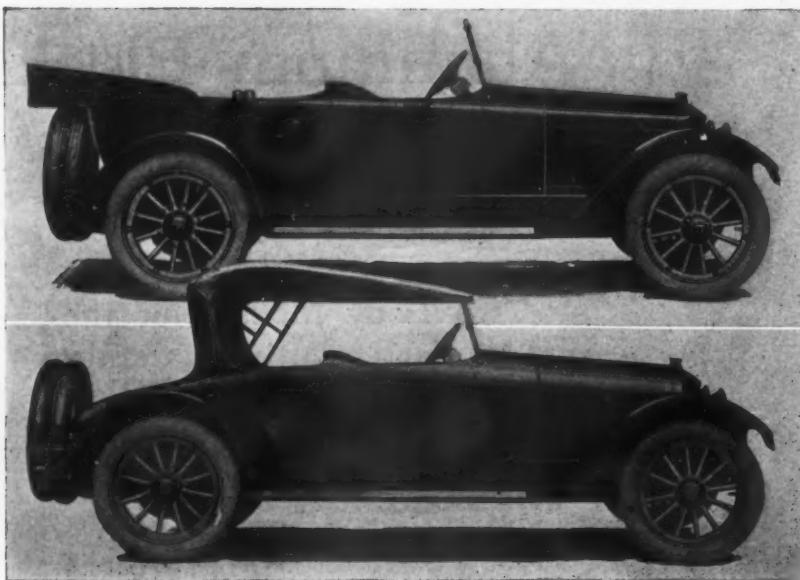
5½-in. aluminum motor, single plate clutch, three-speed gearbox, Timken floating axle and a wheelbase of 125 in. with 35 by 4½ tires.

Although incorporating an aluminum block the engine follows standard practice to the extent of being made up in a unit power plant including clutch and gearbox. The power plant is hung at four points, giving a rigid connection to the frame. The six-cylinder aluminum block incorporates the crankcase as a unit. The cylinder head is removable and is of cast iron. With this arrangement valves can be ground and carbon removed directly by simply removing the holding-down studs. The overhead valves are covered by pressed steel cases fitting over the tops of the cylinders. The cylinders are lined with cast iron sleeves which are pressed in the aluminum casting while the aluminum is in an expanded condition due to exposure to super-heated steam. Since the aluminum expands more rapidly than the cast iron the sleeves are held tightly in place on the shrinkage of the cylinder block. When the cast iron sleeve is worn it can be removed by heating the aluminum in the same manner and driving out the sleeve.

Lynite pistons are employed having three rings above the wristpin. The length of the piston is 5½ in. which is sufficient to hold to a minimum any tendency toward slap. In the skirt below the piston pin there are two rows of oil holes



Two sides of the Premier aluminum engine with cast iron head and pressed steel valve cover and the counterbalanced curved cheek crankshaft



Illustrating the Premier projectile type touring and four-passenger roadster bodies, which now comprise the line

which will prevent flooding of the combustion chamber. Standard practice is followed in regard to the connection of the piston to the connecting-rod. The pin bearing is $\frac{3}{8}$ in. in diameter and has a length of $1\frac{5}{16}$ in. The rod is an I-beam 11 in. long drop-forged from carbon steel. The bearing at the lower end of the rod is $2\frac{1}{4}$ in. diameter by $1\frac{3}{4}$ in. in length. The crankshaft is $2\frac{1}{4}$ in. at the main bearings and is a drop forging from 0.40 carbon steel. The curved-cheek shaft is carried on three main bearings and is counterbalanced on the Wyman & Gordon system. The dimensions of the main bearing are from front to rear $2\frac{3}{16}$ by 3, $2\frac{1}{4}$ by $2\frac{7}{8}$ and $2\frac{5}{16}$ by $3\frac{3}{8}$ in.

Fabroil in Timing Gears

Helical gears are used for the camshaft which is carried in the crankcase. The material of the timing gearset is Fabroil, which is the compressed cotton manufactured under General Electric patents. The generator drive is taken off the camshaft which is carried upon three bearings bushed with bronze in the front and die cast in the center and rear. The diameter of the shaft is $1\frac{1}{4}$ in. It carries the cams integral and these are so shaped as to give the valves a lift of $7/16$ in. The diameter of the valve is $1\frac{1}{2}$ in. in the clear, with spring pressures of 40-60 lb. The actual lift of the cam is only $7/32$ in. but this is multiplied by 2 in the rocker to give the $7/16$ total.

Adjusting the Valves

In making adjustments on the valves there is a nut on the top of the lifter rod. With valves of this size and the overhead arrangement it is expected that the peak of the power curve will be well toward 2800 r.p.m. although no horsepower curves have as yet been submitted. In fact, the engineering department has made a point of good torque at low motor speeds rather than a showy horsepower curve which to the actual owner means little and does not indicate performance at practical speeds.

Combined Pressure and Splash

Lubrication is by a combined pressure and splash system. The oil is forced to the main and connecting-rod bearings and splashed to all the other bearing surfaces. The reservoir is in the lower half of the crankcase and from here the lubricant is taken by a gear pump driven by spiral gears off the camshaft. The pressure is regulated by a by-pass to the tim-

ing gears and owing to the fact that the crank cheeks are curved in carrying out the balancing system, oil pipes are placed across the curvature in the cheeks. The spray off the connecting-rod bearings gives all the oil that is considered necessary. The oil capacity of the crankcase is about 8 qt.

A feature of the oiling system which is somewhat different and is the idea of Earl Gunn, who is chief engineer, is in the knurling of the piston skirt. Diagonal lines about $1/32$ in. apart are carried across the piston skirt. The lines run at about right angles to each other and provide space for a small amount of oil to work its way along the surface of the piston. It also gives room for the metal on the raised portion to spread out should there be any tendency to stick in case the oil level becomes low. While maintaining the oil film this groove forms an oil trap which tends to make each unit of oil do its work before it is again allowed to drain back to the crankcase. The oil filler and oil level gages are on the left side of the engine while the oil pressure is registered on the dash.

In working out the cooling system the water pump is mounted on the front of the cylinder block, the impeller shaft for the pump and the fan shaft being common and driven by a V-belt off the crankshaft. The reduction between crankshaft and the impeller-fan pulley is 1 to $1\frac{1}{2}$. Another feature of the cooling system which is of interest is the use of a thermostat for maintaining the correct water temperature. With this system the water does not flow from the cylinder jackets until the temperature in these jackets becomes high enough for efficient combustion. The thermostat then permits the circulation. In the meantime the pump simply circulates the water through the radiator. This unit is a honeycomb with a capacity of about 6 gal. including the volume occupied by the waterjackets. The by-pass for the thermostat is located over the water pump at the high water level. There is an opening on the camshaft side of the waterjacket casting which considerably simplifies the foundry work on this casting. Over this opening a cover is bolted on, inclosing the push rods. The fan is really the only exposed moving part. This is a four-bladed aluminum casting 14 in. in diameter and the belt which drives it is mounted in front of the fan in order to take up as little underhood room as possible and to secure full benefit of the V radiator.

Two-Unit Electric System

Electrically, the Premier car is Delco equipped, as this takes care of starting, lighting and ignition. It is a two-unit system in which the generator carries the ignition coil and distributor. This unit is driven from the timing gears while the cranking motor engages through a Bendix gear to the teeth on the flywheel. The battery is 100 amp.-hr. Willard mounted between the engine and frame under the hood, an accessible position, and yet the battery is out of sight. The spark plugs are set into the side of the block casting at an angle.

On the rear of the crankshaft there is a flange to which is bolted the 15-in. 60-lb. flywheel. This incorporates the Borg & Beck single-plate clutch. The teeth are cut directly on the wheel and give a ratio of 120 to 13 to the starting pinion.

Gearshifting is accomplished by the use of the Cutler-Hammer magnetic shifter and is now in its improved form. Basically, however, the principle is the same as has been described several times, with the power supplied through solenoid coils operating the selector and shifting units. In installing the shifting arrangement care has been taken in the clutch move-

ment to allow the driver to declutch the engine without shifting gears, the shift being made only on a full depression of the pedal. Aluminum is used for the gearset housing with a sheet steel coverplate.

An S. A. E. bell housing is used but on account of the arrangement of the Bendix gear the holes are differently spaced than the S. A. E. specifications. All through the car, however, S. A. E. standards have been used as closely as possible, especially as regards material.

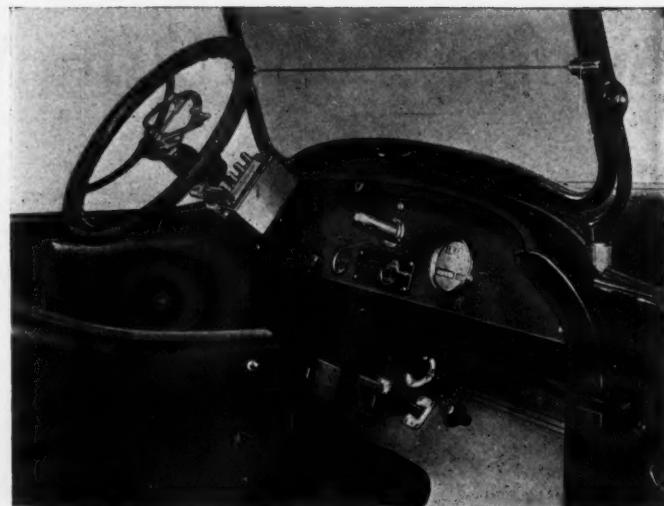
Frame Is Strong

There are two universals on the propeller shaft and the rear axle is a Timken spiral bevel unit with a ratio of 4 5/11 to 1. This is the standard floating unit. The frame construction is extraordinarily sturdy, having a channel section 8 in. deep with a 2 1/4 in. flange of 1/8-in. stock. The flange, of course, tapers in different parts of the chassis. The channel section is so arranged that the web forms the splash apron and the stay bolts for the hangers pass directly through the flanges. The springs are semi-elliptic, 58 in. long and 3 1/4 in. wide. They are a product of the Perfection Spring Co. and take the drive as well as the torque. The steering gear incorporates a worm and full wheel.

Suspended from the rear of the frame is a 24-gal. gasoline tank fitted with a long gooseneck filler opening making filling possible from the side of the curb without using a funnel or clashing with the spare tires. The tank is also so hung that the frame protects it from rear collision. From the tank the fuel is carried to the carburetor by a Stewart vacuum system.

Premier designers have been particularly fortunate in securing a very pleasing combination of body lines. From the radiator, which is a very decided V, the impression is one of a smooth, round, slightly tapered cylinder. The top of the hood is a straight line from radiator to windshield and the sides have the incurve at the top which merges into a cowl behind the front seats. The Premier people call it a projectile type of body and the name seems a particular happy one as applied to the four-passenger roadster. A tilted windshield adds to the effect.

Body room, particularly in the seven-passenger car, is unexpectedly great. An additional 6 in. is obtained so that there is more passenger capacity than ordinarily would be regarded as possible on a wheelbase of 125 in. One feature which will be appreciated by tonneau passengers is the fact that those in spare seats have as much room as those in the tonneau seat proper. This is obtained by cutting deeply into the back of the front seats foot and leg space which is covered up when the spare seats fold in. Front seat passengers are equally well cared for and exit and entrance from the driver's side is made easy by a tilting steering wheel and the abolition of the gearshift lever. The tonneau seats



The dash instruments are easily seen—note position of electric gearshift control on steering column

measure 44 in. from upholstering to upholstering. The latter is of the straight, vertical pleat pattern.

The four-passenger roadster is supplied with doors both front and rear and is not so close coupled.

Dixie Flyer Battery Mounting Changed

(Continued from page 359)

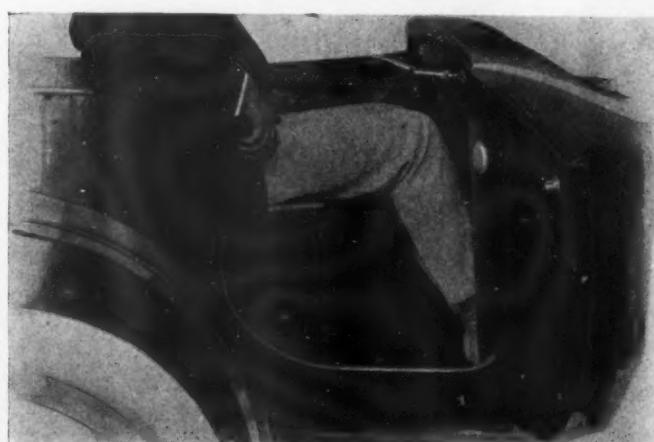
on a double row of S. K. F. self-aligning ball bearings. Between the stem gear and the main spline shaft a roller bearing is used. The material in all gears is 3 per cent nickel steel testing up to 120,000 lb. sq. in. and allowing of quite narrow gears and a short case.

The rear axle is floating with chrome nickel-steel shafts and gears. The final drive is spiral bevel mounted on high duty roller bearings with end thrust bearings on either side. A feature of the rear axle is that all gears and bearings are adjustable, thus permitting a continuity of good mesh and a reduction of noise due to wear.

Electrically, the Dyneto two-unit system is used for starting and lighting and the Connecticut system for ignition. The battery is a Willard. Bendix drive connects the starting motor with the engine through the flywheel ring gear. A wiring diagram is placed on the dash of each car and the individual circuits are marked in different colors so that non-technical owners may have a clear picture of the electrical connections. Each individual circuit such as headlights, tail and cowl lights, ignition and horn is equipped with a separate fuse and the block carrying the fuses is on the dash beneath the hood. The generator cuts in at 10 m.p.h.

Structurally, the frame is a straight pressed steel channel with four cross members and a noticeable absence of castings. Where these are used they are of steel in place of the malleable metal. Drop forgings are used wherever possible to secure strength with minimum weight. The wheelbase is 112 in. Steering is irreversible and the wheels are artillery, using 32 by 3 1/2 tires on demountable rims.

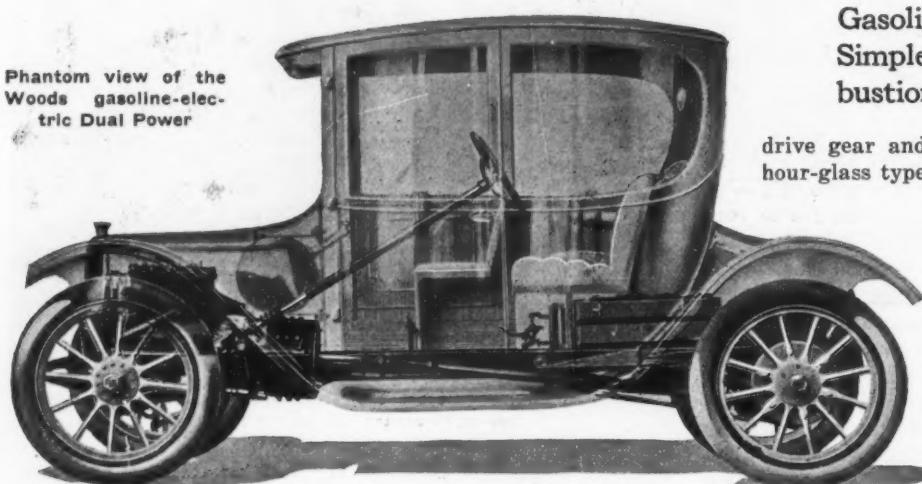
The line comprises two separate bodies. There is a five-passenger touring and a four-passenger roadster, the latter having the cloverleaf seating arrangement. The touring car is a straight line design from the radiator to the cowl with a slight curve in the side rail line. Standard finish is Brewster green with highly crowned fenders in black enamel. The roadster follows about the same lines as the touring car and has a sloping windshield. Individual seats are used in the forward compartment with the rear seat wide enough to accommodate two persons. The top is a one-person design with quick-detachable side curtains and the price of \$795 includes complete equipment.



Wide doors and comfortable auxiliary seats in seven-passenger touring

Simple Control in Woods Dual Power

Phantom view of the Woods gasoline-electric Dual Power



AN electric car, a gasoline car or a vehicle in which both powers may be utilized at once, with the elimination of the greatest inconvenience in electric cars, namely dependence on charging stations, is the Woods Dual Power car.

In the mechanism of the car there are really but three units, irrespective of the driveshaft and rear axle. The gasoline engine is under the hood and directly behind it is the electric motor, a unit is the same drive line. Located under the front seat is the storage battery set. The connecting unit between the gasoline and electric motors is in the form of a magnetic clutch which is simplicity itself. When the gasoline control lever is raised about an inch from full retard the flywheel of the gasoline motor becomes magnetized. The magnetic force pulls a copper disk against the face of the flywheel and the electric motor and the gasoline engine are connected.

Four-Cylinder Block Engine

The gasoline engine is a block cast four-cylinder, with $2\frac{1}{2}$ -in. bore and $3\frac{1}{2}$ -in. stroke. Because of its small cylinder sizes and its high speed operation the engine is very smooth running, being nearly as quiet as the electric motor. Lubrication is effected by a gear pump which lifts the oil from a lower chamber to a compartment around the valve tappets, whence it flows by gravity to the various bearings. Ignition is Atwater Kent, with automatic spark advance. Cooling is thermo-syphon through a honeycomb radiator.

A one-piece gasoline tank with a capacity of 9 gal. is under the cowl. The Exide battery is specially constructed for this car and has twenty-four cells with eleven plates each, considerably smaller than the batteries required for driving all-electric cars.

Much of the smooth riding qualities of electrics has been attributed to the heavy batteries suspended low in the rear or center-rear of the car. With a much lighter battery the Woods car is equally as easy riding as the former all-electrics produced by this same company. This, the makers say, is due to the use of liberal-sized cantilevers on the rear. The front is half-elliptic suspended.

The rear axle is semi-floating with the wheels mounted on driving shafts which ride on Bock roller bearings. The axle tubes are of steel tubing, swaged to shape and bolted through the flange to the axle housing which surrounds the

Gasoline Electric Incorporates Simple Linkage of Internal Combustion and Electrical Units

drive gear and differential unit containing the Baush hour-glass type of worm gear.

The body is an attractive combination of characteristic gasoline and electric car types. It is aluminum-panel construction and the coupé is the only model offered. The doors are wide and contain windows which may be lowered. The front and rear windows may also be opened. The car will comfortably seat four passengers, the driver's seat being staggered ahead of a spacious seat which will take care of two and in front of

which is an auxiliary seat which folds out of the way against the dash.

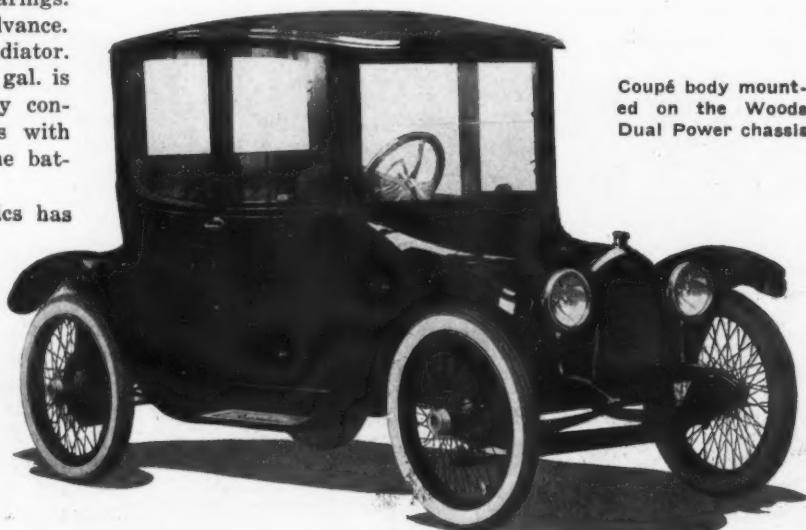
On the instrument board is an ampere-hour meter and ammeter combined and a Stewart-Warner speedometer. There is a three-gang switch for lighting.

The oscillating movement of the pedal is for the purpose of opening and closing the switch of the electric motor. Of course this same operation can be performed with the hand control lever. With the hand lever set at an operating position and the pedal pad oscillated forward there is no current passing to the motor. A movement of the foot and the switch engages and the car starts.

Reverse by Electric Motor

The gasoline engine drives one way only, there being no gearset, and so the electric motor must be called on to run the car backwards. Oscillate the pedal pad forward, place your heel on the small lever against the heel board under the driver's seat, oscillate the pedal backward, the action of the electric motor is reversed, and the car starts backward.

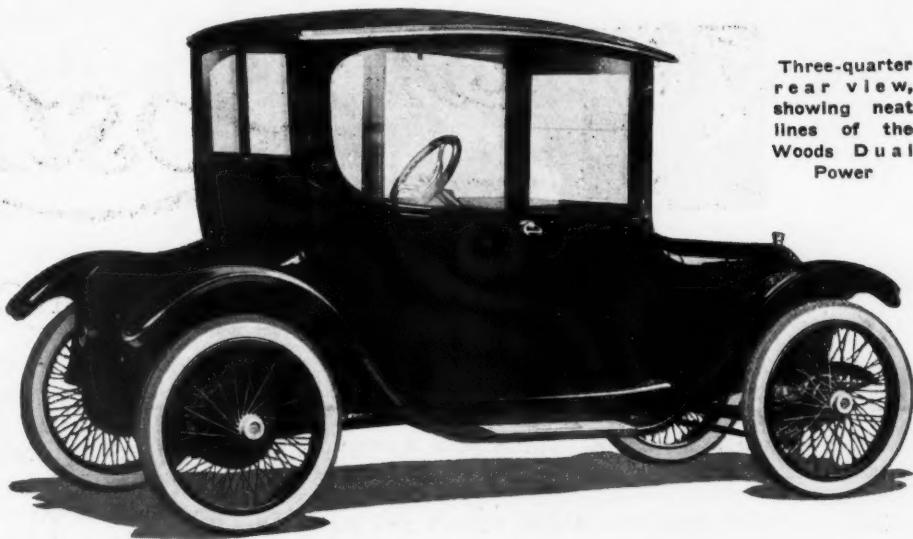
The price of \$2,650 includes a power-air pump, mounted on the right side of the gasoline motor; and a motor-driven warning signal. Wire wheels are listed at \$25 additional and the same figure will equip the car with slip covers. Cars in special color effects to suit the individual tastes of owners



Coupé body mounted on the Woods Dual Power chassis

will be produced for \$100 additional. Deliveries of the new car are already under way.

The controls are simply arranged so that none of the easiness of drive that makes the electric car so popular with women drivers is lost. The absence of complication is marked and a large part of the actual mechanical control is automatic. As in gasoline cars, practically all the driving is done through pedals with very little manipulation to cut into the effectiveness of the hands in steering. There are no gears to shift and all the hill work is simplified by the action of the electric units which take up the work where the gasoline leaves off.



Three-quarter
rear view,
showing neat
lines of the
Woods Dual
Power

Tourabout Body on Empire Six Chassis

THE latest of the four-passenger body designs is the new Empire tourabout which is fitted on the six-cylinder chassis. The new body was designed to provide a snappy type of vehicle of larger seating capacity than the roadster. In exterior line the body carries out very well the suggestion of a speedy yet roomy vehicle. From the high roll cowl there is a gradual downward taper to the rear deck to curved sides without a break or corner at any point.

It is really a four-passenger car in that there is an abundance of room for four persons to be seated in comfort. The front seats are individual with a wide aisleway which gives easy access to the rear seats.

A roomy rear back department is supplied for luggage and access to it may be had by dropping down the back of the rear seat which forms the door to the compartment. It is large enough to accommodate two suit cases and other touring accessories.

Even with the ample room between front and rear seats, the close coupled advantage of all passengers riding between the axles produces easy riding. The color scheme consists of green for the body proper with black hood, fenders and running gear.

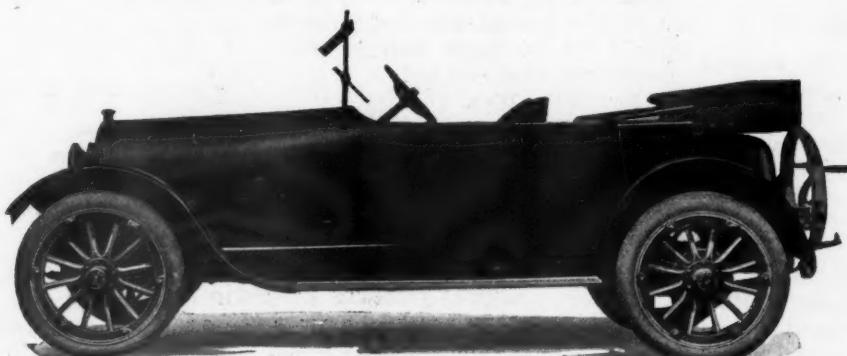
The Empire six chassis has been described before, so it will be enough to say that it comprises a six-cylinder engine $3\frac{1}{4}$ by $4\frac{1}{2}$ in., 120-in. wheelbase and 34 by 4 tires.

Benzol and Alcohol as Fuel

For several years the Paris General Omnibus Co. ran all its De Dion Bouton and Schneider buses on alcohol carbureted with 50 per cent benzol. Later, and until immediately before the war it used benzol only. The disadvantages of

the mixture were difficulty in starting and the necessity of cleaning out the combustion chamber more often than with the use of gasoline. The bus company found that their fuel consumption was at the rate of 0.176 gal. per mile with benzol only; 0.180 gal. with gasoline, and 0.2 gal. for alcohol and benzol. In all the annual French army truck trials held prior to the war, one-third of the total distance had to be accomplished on an alcohol-benzol mixture, one-third on benzol, and one-third on gasoline. Except for the difficulty in starting from cold the alcohol-benzol mixture was as satisfactory as the other two fuels.

Since the outbreak of the war there has been no use of benzol and alcohol in the motor services of the Allied armies, these two fuels being monopolized for the making of explosives.



Above—Seating arrangement of the Empire four-passenger roadster, showing passage between front seats and relative capacity of rear seat. Note fold-down back on rear seat and also amount of leg space in rear

Left—The new Empire four-passenger roadster, showing the low lines which maintain the roadster form and yet give the car the capacity of a small touring body. Note torpedo stern and manner in which top covers rear seat



The Rostrum

Ammeter Not Advisable on Cole 4-40

EITOR THE AUTOMOBILE:—I have a 1913 model Cole 4-40 touring car that is equipped with a Delco lighting and starting and ignition system and desire to install an ammeter on same. Please give instructions in installing it and what should be the graduations of the ammeter.

I use a 12-cell type SD-3 Exide battery and desire to charge the batteries without taking them off the car. Using a 6-volt direct-current circuit, could I not disconnect the wires from the generator and connect source to them and charge them that way?

Which are the generator terminals and at what amperage should the battery be charged? Please give diagrams of the above.

Senath, Mo.

L. A. C.

—It is not recommended that such an installation be made on this particular system because of the fact that on the 6-24 volt system the meter would have to register the cranking current as well as the charge and discharge rates when connected to show the net charging current. The installation would, therefore, fall for an ammeter having about 50 amp. as a maximum on each side, and in view of this fact, it is not believed that the meter would do any good, particularly as the ampere ammeter on this system enables one to get a fair idea of whether or not the battery is being properly charged.

In regard to the charging of the batteries, this is a perfectly feasible thing to do from a 6-volt source by connecting the positive terminal and negative terminals in parallel and then connecting the 6-volt source as shown in Fig. 1.

All terminals of the generator are used when the machine is generating current. Referring again to the diagram, these terminals are numbered 1, 2, 3 and 4. The No. 3 terminal is the negative one which is connected to the negative terminal at the battery through the wire and connections in the controller switch and the No. 4 terminal is also connected through the wiring and connections to the positive terminal of the battery. The No. 4 terminal, however, is one end of the reverse series winding. The 1 and 2 terminals are the positive shunt field terminal and the positive brush lead and when connected to the meter contacts permit the generator to charge the battery. If there are no connections between the Nos. 1 and 2 terminals the generator will not charge in the proper direction.

Olds 1907 Loses Power on High

Editor THE AUTOMOBILE:—I have an Oldsmobile model A roadster, No. 61047 which runs all right on reverse, low and intermediate, but when I shift into high the car comes to a bucking stop, and then if shifted into intermediate it will act the same way. Will you kindly explain as to what causes this trouble and, if possible, publish a sketch of both gearbox and differential?

Pittsburgh, Pa.

F. J.

—In a similar case to the one you mention, the balking was found to be due to worn out pistons and cylinders; in other words, the engine had no power, and as soon as it was thrown into high speed it stuck. As this car is a 1907 model,

it is very probable that after 9 years of service the pistons and cylinders as well as the valve will be in bad shape.

Efficiency of Final Drive

Editor THE AUTOMOBILE:—Which mechanism delivers the most power to the rear wheels of an automobile, viz., chain drive, carried through jackshaft to sprocket and chain to rear wheels, or direct drive from transmission to the bevel gears in rear axle then delivered to wheels through semi or full floating axle?

Seattle, Wash.

W. A. W.

—The entire matter of friction loss depends on the amount of bearing surface as well as in the manner of drive. A table giving the transmission efficiency of different types of mechanism has been worked out by Worby Beaumont and is considered quite reliable. This table is as follows:

Source of Loss of Power	Amount of Loss Per Cent	Efficiency Per Cent
When driving direct:		100
One chain	3.0	....
One and one-half pairs of bearings.....	7.5	89.5
With epicyclic speed gear in operation, add	15.0	74.5
When driving direct:		
One set of gears.....	5.0	....
Two pairs of bearings.....	10.0	....
Partially active bearings.....	3.0	82.0
With change-speed reduction gear in operation, add	12.0	70.0
One set of gears.....	5.0	....
Three pairs of bearings.....	15.0	....
Equivalent of two chains.....	6.0	74.0
Two sets of gears.....	10.0	....
Four pairs of bearings.....	20.0	70.0
Two sets of gears.....	10.0	....
Five pairs of bearings.....	25.0	....
Equivalent of one chain.....	3.0	62.0
Equivalent of three sets of gears.....	15.0	....
Five pairs of bearings.....	25.0	60.0

Cannot Change Buick 25 Ratio

Editor THE AUTOMOBILE:—I have a 1914 model B-25 Buick touring car which is geared 13½ on low, 6 on second and 4 on high, which is a little too high a gear for this rough country. I wish to change the gear so I will have a 16 to 1 on low, 8 or 8½ on second and about 5 or 5½ on high. What would be necessary to make the desired change and where could the necessary parts be obtained? Also, about what would the total cost be?

Newcastle, Wyo.

L. R. K.

—The Buick company cannot supply special gear ratios for these cars, owing to the fact that there is just room in the differential housing to take care of the present ring gear and there would be great difficulty in fastening a smaller pinion to the shaft.

Eight Cylinders Placed in Line

Editor THE AUTOMOBILE:—What would the crankshaft for an ordinary eight-cylinder engine look like in case all the

cylinders were put in line? Is there any angle other than 180 deg. between the different crankpins?

Milwaukee, Wis.

W. F. O.

—The simplest way would be to have all the cranks in the same plane just like two four-cylinder crankshafts both together. An arrangement with cranks at 90 deg. would, however, be possible.

The easiest way to explain it is to say that with eight cylinders in line you have the equivalent of two four-cylinder engines coupled and you can regard the first four-cylinder as one engine and the second four as the other or you can regard cylinders 1, 3, 5 and 7 as one four-cylinder engine and 2, 4, 6 and 8 as the other.

Packard Uses Double Distributer

Editor THE AUTOMOBILE:—Does the Packard company use a separate coil and time for each half of its twin six? Kindly explain how same is timed.

2—Who makes the engines used on Paige, Jeffery, Mitchell, Kissel, H-A-L, Studebaker and Reo cars?

3—What ignition is used on the H-A-L twelve?

Mount Hope, N. Y.

T. K.

—No. There is a double distributer, however, and the timing is exactly the same as for two independent six-cylinder engines, each half of the distributer taking care of a set of six cylinders.

2—Paige, Rutenber, small six, and Continental, large six; Jeffery, Buda on the six and own on the four; Mitchell, own engine; Kissel, own; Studebaker, own; Reo, own; and H-A-L, Weidely.

3—Remy ignition.

Rebuilding Haynes for High Speed

Editor THE AUTOMOBILE:—Am rebuilding a Haynes model Y for speed. Have cut wheels down to 32 in. and changed ratio to 2½ to 1. Am cutting aluminum pistons with head slightly crowned.

In your opinion would I gain anything by changing timing of valves, and if so what timing would you advise?

Galion, Ohio.

R. W.

—Possibly some speed would be gained by pushing the timing of the exhaust valves ahead about one tooth in the camshaft drive. This would probably affect the low speed running but may increase the power of high speed. The inlet valve timing should be changed to open around 10 deg. late and close from 45 deg. to 48 deg. after bottom center. This being a rather old model, built in 1910, the valve sizes are not sufficiently large to make for high speed and there is a possibility that very little, if anything, will be gained.

It must be remembered that between the years of 1910 and the present time engines have undergone a distinct change in design. One of the factors in this is the falling off in the quality of fuel. The engines of that time cannot burn the present grade of low-grade fuel to the same advantage as the engines of to-day which are designed to have the incoming vapor preheated to some extent.

Making a Racer Out of a Ford

Editor THE AUTOMOBILE:—I want to cut a Ford down to racer type. Do not care for speed of more than 50 miles, but as Pittsburgh is very hilly, must have power enough to climb hills on high. I realize by cutting the machine down it will cut the wind resistance and I figure on changing the gear ratio on high to 3 to 1.

Would the regular Ford engine give me power enough to take stiff hills on high with the gear ratio changed to 3 to 1, or would I have to install aluminum pistons to get additional power?

Pittsburgh, Pa.

W. J. G.

—No doubt you would get more satisfactory results if you are looking for high speed with lighter pistons. As far as taking hills on high gear is concerned, it is doubtful if the lighter pistons will make any difference, as the effects of light pistons do not come in until the speeds are quite high. With a 3 to 1 gear ratio and a very light chassis, the Ford engine has a great amount of hill-climbing power.

Installing a Battery for Headlights

Editor THE AUTOMOBILE:—I want to make a change on the lighting system of my Ford car. At present I have a Prest-O-Lite, but my lamps are about shaken to pieces and I have a good pair of electric reflectors, a motor-driven signal and batteries are expensive and not very strong either unless I get about six of them. Taking everything into consideration, I think it would be better if I would trade for a storage battery. I can get a 120-amp. battery charged here for \$1.25 and would like to know how many hours this capacity battery would burn three lamps, all consuming 6 amp. I have a house-lighting system handy, of 110 volts, alternating current (Keokuk), and I would like to know about what the cost would be to arrange it to charge my battery, also the instruments needed. My ideas are to have a light, one that is dust and mud-proof and handy.

Would it be necessary to install fuses and the method of placing on the lines, etc., for two headlights and tail lamps, also trouble lamp off and on socket to wire direct from battery, so as not to use all lights when using trouble lamps?

Please sketch a diagram of wiring and where to place fuses, if needed. Would it be a safe place to put the fuses behind the foot or heel board next to the gasoline tank and the switch directly in front—that is, on the front side?

Vandalia, Mo.

J. R.

—Probably the best way to take care of your lighting and warning signal would be to install the battery as you suggest. A 120-amp. battery would only support three lamps which consume 6 amp. for a period of 6 2/3 hr., but there is no reason why you should use such large lamps as this. A 6-amp. lamp with a Tungsten filament would give about 36 candlelight power lights and you will find that these are ample and besides will only require about 1 amp. each in current. In fact, the tail light can be smaller than this.

It will not be necessary for you to install fuses, but simply to wire the lamps directly to the battery and switch. The same applies to installing the trouble lamp.

To secure an outfit that will enable you to charge your storage battery from 110-volt alternating current system, would be quite an expense, as it would be necessary to get a rectifier and also to fit up a large complicated switchboard. It would be better to get the small lamps and battery and to have the battery charged whenever it is exhausted.

If you are doing a very large amount of night driving you will probably secure greater satisfaction from the gas lamps, but for a small or medium amount of night driving the electric lights will be very convenient.

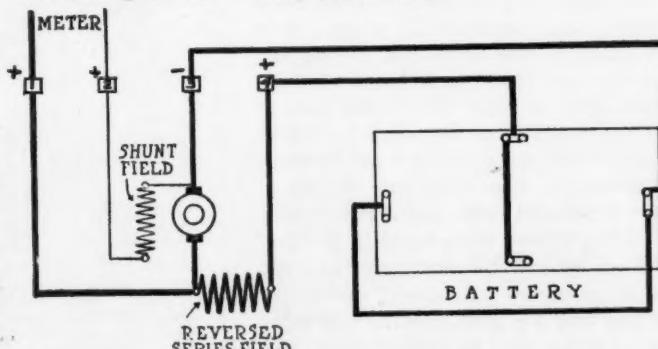


Fig. 1—Terminal connections in parallel for charging 12 cell storage battery

ACCESSORIES

U. S. JACKS

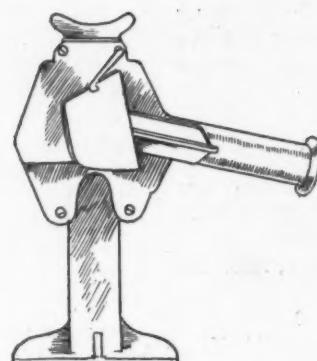
HERE are three styles of U. S. jacks. One is a tire-saver, made in two sizes, the smaller having an adjustment of 11 to 18½ in. for pleasure cars and the larger with an adjustment of 12 to 20 in. for heavy passenger cars or trucks. The lever is so arranged that when the jack is raised it is automatically locked. The unique No. 2 jack is a malleable iron design for heavy passenger cars, and has an adjustment of from 9½ to 17 in. It requires about 30 lb. pressure on the end of the handle to lift a heavy car. No rivets are used in its construction, and screw holes are provided so that it may be mounted on a large block of wood for stability. The unique No. 1 jack is similar in design to the tire-saver, and is recommended for cars weighing up to 2500 lb. It has an adjustment of from 9½ to 17 in.—U. S. Mfg. Co., Mansfield, Ohio.

Wash-stand Floor Trap

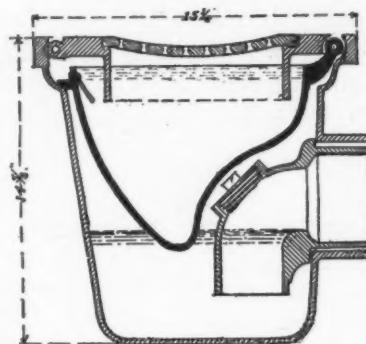
With the ordinary type of trap the sediment washed from the cars is certain to settle in it and gradually fill it up. In the Lynn trap this difficulty is overcome by providing a sediment cup into which the water drains directly from the floor. Most of the dirt remains in this cup and comparatively clean water overflows into the bottom of the trap and thence to the sewer. The cup, like the floor grating above it, is hinged, so that it is but a moment's work to empty the contents of the cup. No. 1 size has 3-in. outlet, No. 2 is similar but with polished brass top grate, No. 3 has twice the capacity of No. 1 and No. 4 is the same as No. 3 but with polished brass top grate and frame. Prices: No. 1, \$15; No. 2, \$50; No. 3, \$30, and No. 4, \$70.—Lynn Stall Co., Lynn, Mass.

Combination Gasoline Lock

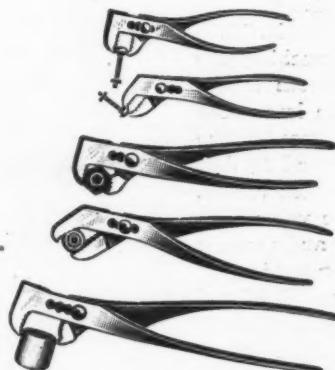
The device is operated from the dash or cowl board and consists of three disks revolving in a chamber and engage with each other in the same manner as the disks of a combination lock. Each disk is pierced by a hole. When the lock is open the holes of all three disks are in alignment and the gasoline flows through unobstructed. The disks are controlled by the numbered dials, but a single turn on the dial throws these holes in the disk out of alignment and positively locks the flow of gasoline. A great variety of numbers may be used, making combinations of either two or three figures, and the owner can set his lock to any desired combination in case of discharging



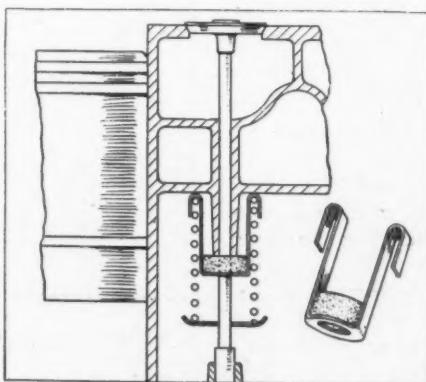
United States Jack



Wash-stand floor trap



Eagle Claw wrenches



Apco valve guide packing for Fords

a chauffeur. The combination lock may be opened in the dark by feeling the notches. Inside the device is a strainer and filter cup which prevents dirt from clogging the needle valve seat. The cup also serves in removing water from the gasoline and the impure grease may be periodically removed by unscrewing the cap at the bottom. The price is \$3.50 for cars with cowl boards and \$3 for straight dashboard equipment.—Turner Brass Works, Sycamore, Ill.

Eagle Claw Wrench

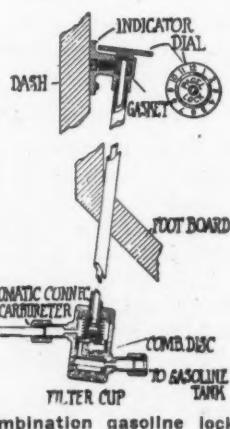
Several styles of Eagle Claw wrenches are made and are designed to handle all sizes and shapes of work. The different sizes are adjustable from zero to 2 in. Prices: 7 in., \$7.20 per dozen; up to 13 in., \$15 per dozen.—Mechanical Specialties Co., People's Gas Building, Chicago, Ill.

Apco Valve Packing

This is a simple device for Fords designed to prevent leakage through worn valve stem guides. It consists of a thick felt washer, which goes around the stem and is pressed closely to the guide by a fitting which is attached to the top of the valve spring. New felt washers should be put in every time the valves are ground. Price, 50 cents; felt washers, 12 cents per dozen.—Auto Parts Co., Providence, R. I.

Westinghouse Charging Outfit

This rectifier outfit consists of a transformer-reactance and Cooper-Hewitt rectifier bulb mounted on a cast-iron frame. The transformer is so arranged as to deliver, without the use of extra resistance or reactance coils, the gradually decreasing current best suited for battery charging. Terminals are provided for connecting the alternating-current lines and the battery circuits to the outfit. Fuses for overload protection are placed in both the alternating and direct-current circuits. A simple starting switch, the two link connectors, by means of which transformer connections are changed to suit any particular battery and line voltage within the limits of the outfit, are additional features. This outfit has been designed pri-



Combination gasoline lock



Icy-Hot motor restaurant

marily for the car owner who is not an electrical expert.—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Icy-Hot Motor Restaurant

A motor restaurant at a more reasonable price than the wicker baskets used by many owners. The new models, made for parties of four or six, have cases of basswood, a material that shows very little tendency to warp. The box is 12 in. high, 15½ in. wide and 9½ in. deep. The color of the case is black, with a finish like patent leather, and impervious to water. The lining is in Bakst style.

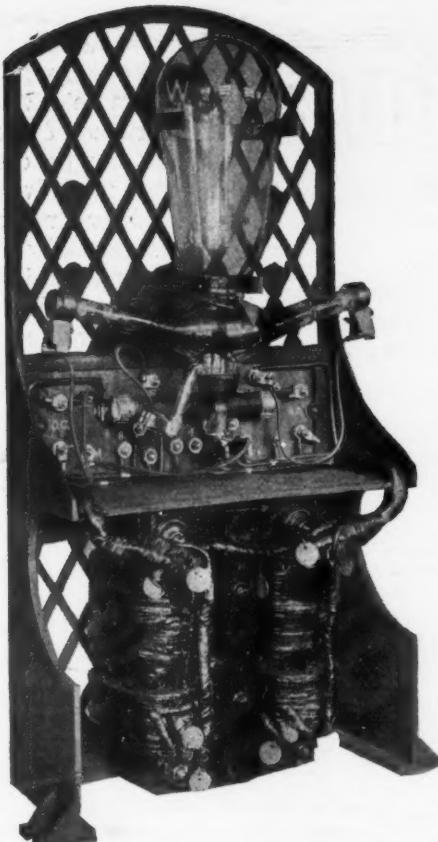
It contains plates, knives, forks, napkins, cups, spoons and jelly jar and a large lunch box. The lower half has three divisions, two for vacuum bottles or jars and the other for fruit, crackers, cake, etc. There is a division above for an Icy-Hot jar or bottle, so that three vacuum containers can be carried.—Icy-Hot Bottle Co., Cincinnati, Ohio.

Babbitt Spring Oiler

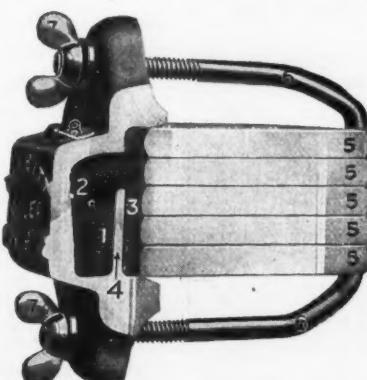
This is a spring lubricator consisting of a felt whip housed in a metal casing and clamped to the side of the spring. Oil is supplied once a week. Price, \$4.50 to \$12 per set.—Babbitt Spring Oiler Co., Penn Building, Cleveland, Ohio.

Blackmore Convertible Ambulance

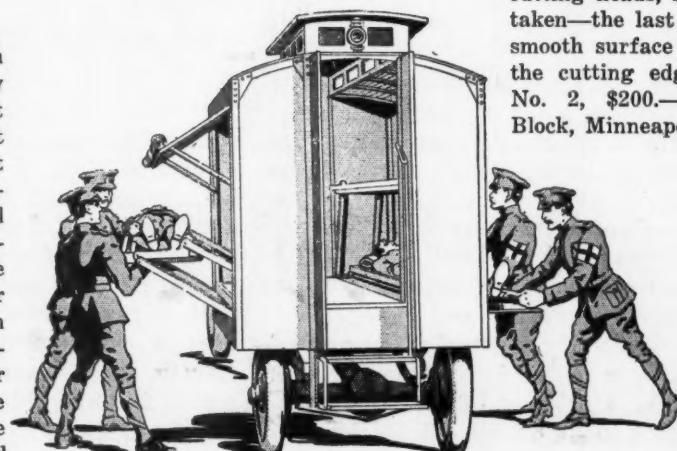
This convertible ambulance body, with side loading feature, is adaptable to any chassis. The sides of the body swing out on pivots and cause trays that are built in combination with the sides to project beyond the body, and upon them stretchers are placed, after which the trays and stretchers are lifted in a horizontal position inside the ambulance. One stretcher may be placed slightly higher than the floor and another above it on the same side, while opposite them another tray may be utilized as a bench or other stretchers may be loaded, as the first two stretchers. These bodies are suitable for military use, hospitals and



Westinghouse charging outfit which consists of a transformer-reactance coil and a Cooper-Hewitt rectifier both mounted on a cast iron frame



Babbitt spring oiler



Left—Blackmore convertible ambulance body with side loading feature. It is adaptable to any chassis and is suitable for military, hospital and police work

city police work.—Charles C. Blackmore, Dayton, Ohio.

Instant Back Curtain Light

This accessory consists of a frame designed to fit the back curtains of 70 per cent of all cars. The frame has flexible edges, to which the removable celluloid light is attached by snap fasteners. Price, \$2.50. Auto Patent Equipment Co., 216 Post Square, Cincinnati, Ohio.

Universal Night Signal

This night signaling device consists of a blown flesh-colored celluloid hand which fits over a tubular flashlight equipped with a special reflector for the lamp. The Universal signal allows the same well-known method of signaling to be used at night as during the day. The hand may be detached and the flashlight used as a trouble lamp in the garage or on the road. It sells for \$2.50.—Yankee Mfg. Co., Milwaukee, Wis.

Steer-Adius for Fords

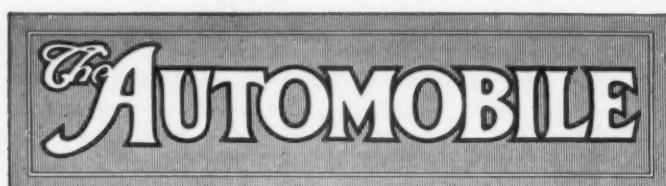
The Steer-adius is a combination of two devices, one for preventing rattle in the front ball joint and the other for making steering easier. The former is a central radius rod running from ball joint to axle and is adjustable, while the latter consists of two heavy coiled springs fastened to this central rod and with connecting rods running to the tie rod extremities. The device may be attached in a few minutes. It lists at \$2.50.—Modern Specialty Co., Racine, Wis.

Perma-Tite Tire Patch

This is a tube and tire patching outfit for all sizes of repairs. The patch is applied cold, a thin coat of the cement being applied and the patch put in place. Permanent vulcanization is said to take place, due to the heat and air pressure of the moving tire. Price, \$1.75.—Motor Supplies Mfg. Co., 21 Fifth Street, N. E., Minneapolis, Minn.

Cylinder Reboring Tool

This is a simple, compact tool designed especially for reboring cylinders. It is belt-driven and is provided with three cutting heads, so that three cuts can be taken—the last cut is said to produce a smooth surface because of the width of the cutting edge. Price, No. 1, \$175; No. 2, \$200.—Machinery Co., Boston Block, Minneapolis, Minn.



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Tractor Trial Wanted

THE automobile arrived at its present stage of development as rapidly as it did largely because of the practice of organizing trials to destruction. Something much the same is now needed if the pace of progress in tractor engineering is to be accelerated to a maximum.

The best way to test a machine is to pit it against the hardest possible task and to increase the severity of the conditions till something breaks. Thus step by step the weak spots are found and can be eliminated. A thousand miles' trial 10 years ago showed more about the weak spots in automobile chassis than would have been discovered in 2 years of normal service.

A properly arranged tractor trial or series of trials held now would settle some of the vexed questions of design outright, questions that will make years to settle if service in the user's hands is to be the only criterion.

The three main needs of a tractor are:

- 1—Power sufficient to meet all conditions.
- 2—Efficiency to prevent waste of power.
- 3—Reliability to prevent delays and expense.

Tractor engineers are not yet satisfied on any of these counts. The proper power is not known, or is not agreed upon. The efficiency of the transmission, the fuel efficiency and the oil efficiencies are

admittedly capable of improvement. The most frequent causes of trouble, defeating reliability, are only known machine by machine and not generally.

A competitive trial is the best way to answer the multitudes of questions into which these three main heads can be divided. Not a competitive trial arranged for advertising purposes, a trial intended to show how fine and grand everything is, but a trial to the breakdown point, a trial so drawn that weakness cannot fail to be discovered.

Just to indicate roughly the sort of lines along which a tractor test ought to be arranged, mention may be made of a few of the main things that should be included.

First, make a horsepower test at the flywheel and a drawbar horsepower test, both at full power.

Second, have a long field trial, say 12 hours' plowing at full load.

Third, repeat the flywheel and drawbar power tests to see if there is any falling off in power or efficiency.

Fourth, throughout the fuel and oil consumed should be measured and the number of stops and the reasons for them noted.

Fifth, the time taken in cleaning and oiling vital parts should be observed competitively.

Sixth, ease of control should be a factor in the awards.

Seventh, something should be devised that would show up the advantages of accessibility and of proper inclosure of working parts.

Eighth, protection against weather should be tested in some way and the facilities for replacing such parts as are bound to wear out. For example, where a ring gear is used on the driving wheel, part of the test should be the removal and replacement of the pinions on the driveshafts, against the watch.

At the present stage there should be no need to classify machines. It is just a matter of work done against cost of doing that work; of work done against wear and tear in the doing of it. One trial of a day's duration is, of course, not sufficient or anything like sufficient; a series is needed testing first one sort of service and then another. For example, we have dry weather good for plowing and wet weather good for a hauling test on the road. Everything that the tractor can legitimately be asked to do wants to be done competitively and in a big way.

Mathematical Cycles

IT has now been convincingly proved—by mathematics—that the constant pressure cycle is and is not the answer to many of the constant volume problems. The formulae of thermo-dynamics have been called upon to advantage by both sides in the argument, and it seems now that the only remaining thing to do is for some of the firm believers in the future of the constant-pressure cycle to step forth with a manufactured engine and let all interested parties see it perform its work efficiently or inefficiently, as the case may be. Mathematical arguments and even blueprints of suggested engines will never tell the story.

Rio Brazil's Business Center

U. S. A. Car and Accessory Makers Should Establish Headquarters in That City

WASHINGTON, D. C., Aug. 28—"If you are contemplating establishing your car or accessory business in Brazil you should establish such headquarters in the city of Rio de Janeiro." This advice is contained in a recent consular letter from the consul-general at Rio. "While Rio may to-day not be so good a market for U. S. A. cars or accessories as the city of Sao Paulo, and while Rio is situated in a federal district surrounded by mountains so that you cannot tour 50 miles to the summer capital, yet Rio is the correct place for Brazilian headquarters of any U. S. A. firm. The reason is simple.

"Brazil is an assemblage of twenty-one states, each of which has a remarkable degree of autonomy, and the capital city of Rio is located in a federal district, just like Washington in the District of Columbia. Articles Nos. 7 and 9 of the Brazilian constitution provide that the Federal Government enjoys the duties from customs and other duties on all imports.

"The duties which may be levied and collected on all exports are the properties of the individual states in which the factories are located, and each of the twenty-one states has its own export tax and can change these taxes to suit its pleasure.

No Export Duty

"It is this export tax situation that makes it infinitely more important for a foreign corporation or manufacturer to establish headquarters in Rio as compared with Sao Paulo or any other Brazilian city. Rio levies no export duty on parts shipped to any of the Brazilian states or to any foreign countries. Thus by establishing headquarters in Rio you can ship to any and all of the twenty-one Brazilian states without fear of an export tax, and you can ship to any of the other South American countries if desired.

"There is a further advantage in establishing headquarters in Rio. The city of Rio de Janeiro occupies practically a monopoly in the distribution of merchandise throughout Brazil. This distribution is chiefly by means of the government-owned railways, the Central Railway of Brazil, which connects the federal capital with the interior, and also by the many coastwise steamers of the Lloyd-Brasileiro Steamship Co., also a government-owned system. This company also has a line of ships running between the U. S. A. and Brazil.

THE AUTOMOBILE

"Further, the importance of Rio as a distributing center for Brazil is shown by the fact that thousands of merchants from the different states visit Rio annually. Rio is the political as well as the mercantile center of the country.

"The American salesman who comes here with a motor car whose merits he is prepared to demonstrate asks, first of all, for an operating license. He is naturally inclined to think that this is due him as a right. Unfortunately, the local law makes no provision for temporary operating licenses, and what he considers as no more than his due must be asked for, as a 'special privilege to a foreign firm,' by the consulate-general. Brazil does not have two forms of licenses, one for the owner or demonstrator of a car and another for the professional chauffeur; nor is an applicant immediately granted an operator's license without examination.

"Once he has obtained a special license the salesman must be prepared to show it on all occasions, and perhaps to submit to a little curious inquiry of a purely personal nature on the part of some good-natured policeman with a thirst for knowledge as to the enterprising methods of foreign firms. The license is not based upon the horsepower of the car, and it is not valid after one has crossed a state boundary. It is to be hoped that within a short time certain ordinances may be passed in Brazil which may alleviate most of the difficulties now encountered in that country.

"There is no class of salesmen who should more carefully remember the requirement of the Brazilian customs laws regarding samples than automobile salesmen. A salesman who has with him cars for demonstrating purposes should remember that he cannot have them enter the country in bond without, before his departure from the United States, obtaining a Brazilian consular invoice declaring them to be samples."

1000 Per Cent Increase in Springfield Body Orders

SPRINGFIELD, MASS., Aug. 26—A 1000 per cent increase in orders during the last 12 months has been made by the Springfield Body Co., this city. Those companies which have adopted the Springfield body as standard equipment include: Abbott-Detroit; Cadillac; Cole; Davis; Haynes; Interstate; Marmon; Mitchell; Oldsmobile; Overland; Paige-Detroit; H. A. L.; Reo; Stearns; Studebaker; Velie; Westcott and Winton.

Peerless to Build Addition

CLEVELAND, OHIO, Aug. 26—The Peerless Motor & Truck Co. will build an addition to take care of the European order for trucks recently received.

Bearings Service Co. Organized

Will Take Over Timken, Hyatt and New Departure Service Work

DETROIT, MICH., Aug. 26—The Bearings Service Co. has been organized here to handle the service for anti-friction bearings for all types of motor vehicles, and already has contracted with Timken, Hyatt and New Departure to conduct the service operations for these three large bearing manufacturers. The Bearings Service Co. in reality takes over the service operations of these three, and the idea is similar to that of the union railway station, where competing lines enter a city. Instead of a station for each railway, one station takes care of all.

It is pointed out that the Bearings Service Co. is entirely separate from the companies whose product it will care for, and it is interesting to note that the automobile business, which means progress, has taken the initiative in this new industrial move—a union of competitors so that their service to the public may be more far-reaching and effective.

Branches with Complete Stocks

The Hyatt company has service branches in the principal automobile centers, and Timken also has several such branches, but these will all be taken over by the new company, and it is stated that when, in the fore part of September, the Bearings Service Co. begins active operations a union station will be opened in each of nine separate cities. All will carry complete stocks of all of the bearings manufactured by the companies above mentioned.

It is the plan to eventually establish union stations in fifty or more automobile cities, thereby placing this service within reach of most motorists.

The general offices of the new concern are located here. No details as to the men back of the new venture are divulged at this time. It may be said, however, that it is amply financed.

Dann to Make Self-Oiling Bearing Material in New Plant

CLEVELAND, OHIO, Aug. 28—The Dann Products Co., Chicago, Ill., maker of the Dann spring insert for lubrication purposes, will build a plant in this city in which it will also make a combination of graphite and metal for bearings which, it is claimed, will not require lubrication. Three acres costing about \$17,500 have been bought in East 152nd Street, adjoining the new plant of the Jordan Motor Car Co. The Dann plant will cost upward of \$100,000.

Alliance Tire Co. To Expand

Capital Increased from \$150,000 to \$650,000—200% Larger Output Planned

ALLIANCE, OHIO, Aug. 28—An increase of \$500,000 in capital stock from \$150,000 and a 200 per cent increase in the output of the Alliance Tire Co. has been voted by its stockholders.

In order to accomplish this, a new company, known as the Alliance Tire & Rubber Co., will be formed, securities in which will be marketed to the general public. The stockholders will take the preferred stock of the new company at par for their present holdings and a 20 per cent stock dividend, payable in common stock of the new company.

The additional capital will be used for the enlargement of the factory, the installation of additional mills, calenders and vulcanizers. A three-story structure closely resembling the original plant, to be built immediately adjoining the present plant, is under consideration.

Cutting, Armstrong & Smith Seek Site for Plant Addition

ROCKFORD, ILL., Aug. 26—Representatives of the Cutting, Armstrong & Smith Products Co., Detroit, Mich. were here this week, looking for a site for a proposed addition to their \$3,000,000 automobile engine plant. Other cities of Illinois and the Middle West will be visited before a location is selected. Motors and axles are manufactured. The proposed branch plant will have a capacity of turning out 100 motors per day at the outset.

Sewell Cushion Wheel Co. Adds

DETROIT, MICH., Aug. 28—To care for growth of its cushion wheel business, the Sewell Cushion Wheel Co., maker of a special form of truck wheel with a shock-absorbing rubber portion, has started building operations on an extensive addition to its present plant here. The new building will be of re-inforced concrete and three stories high with dimensions of 70 by 74 ft. If present increase of business continues, the Sewell concern, it is stated, will tear down the old building after the addition is completed, erecting eventually a five-story re-enforced concrete structure by adding two stories to the new part and building five new stories replacing the old part.

\$250,000 Plant for Sterns Tire

ST. LOUIS, Mo., Aug. 28—The Sterns Tire & Tube Co., a subsidiary of the Efficiency Oil Corp., will build a four-story plant here costing \$250,000. The structure, which will have a capacity of

1600 casings and 3200 inner tubes daily, will be 120 by 200 ft., and the site is at Kienlin Avenue and Terminal tracks.

The product will be known as Sternwear and the tubes will be sold under a guarantee of 20,000 miles of service without puncture, blowout, or rimcutting.

Mr. Sterns has closed a deal with Henry Matthews, Trenton, Ont., whereby the latter obtained the manufacturing and selling rights of Sternwear tubes and casings in Canada. Mr. Sterns says the consideration was in the neighborhood of \$500,000. Mr. Matthews has organized the Sterns Tire & Tube Co. of Canada, and has begun work on a large plant at Trenton.

Koehler Absorbs Factor

NEWARK, N. J., Aug. 25.—The H. J. Koehler Motors Corp. has been formed here with a paid-in capital of \$425,000 to succeed the H. J. Koehler S. G. Co. and the L. E. Schlotterback Mfg. Co. The Schlotterback company was the factor for the Koehler company, which designed and sold the Koehler 1-ton truck. The combination is for the purpose of increasing production.

H. J. Koehler remains the president of the new concern and the product and its price, \$895, are unchanged. Mr. Koehler formerly handled the Ford, E. M. F., Buick, Hupmobile and Grant, introducing each of these into the Eastern territory.

Cleveland Makers Using Tents

CLEVELAND, OHIO, Aug. 26—Tents are being erected by several of the local automobile makers to take care of the heavy business this season. The tents are being used for storage and assembling. Among those using them are White, Winton, Jordon and the Baker-Rauch & Lang Co.

Locomobile Lamps Do Not Infringe Massachusetts Regulations

BOSTON, MASS., Aug. 28—Locomobile lamps do not infringe the regulations of the Massachusetts Highway Commission, according to a decision in a test case, just handed down.

Willis Is U. S. Rubber Purchasing Agent

NEW YORK CITY, Aug. 25—R. S. Willis has succeeded C. A. Emerson as purchasing agent of the United States Rubber Co. Mr. Emerson is retiring after 29 years' work with this company.



Tread of the Pennsylvania Bar Circle tire

Acme Truck Doubles Capital

Increase from \$100,000 to \$200,000—Plant and Output To Be Expanded

CADILLAC, MICH., Aug. 24—The Cadillac Auto Truck Co., this city, maker of the Acme truck, has voted to increase its stock from \$100,000 to \$200,000. One-half of the new stock will be sold in the near future and the shares, having a par value of \$10, will sell for \$11.50. No date has been set for the sale of the remaining \$50,000 of new stock.

The company will soon start the construction of a new building, which will be 200 by 65 ft. Production is to be increased during the coming year and an other model, a larger truck, is to be added to the company's line.

Firestone to Add

AKRON, OHIO, Aug. 25—The Firestone Tire & Rubber Co., this city, has taken out permits for two buildings, aggregating in cost \$105,000. The largest building will be five stories in height and will cost \$70,000. This will be used for mechanical devices. The other building will cost \$35,000 and will be an addition to factory No. 6.

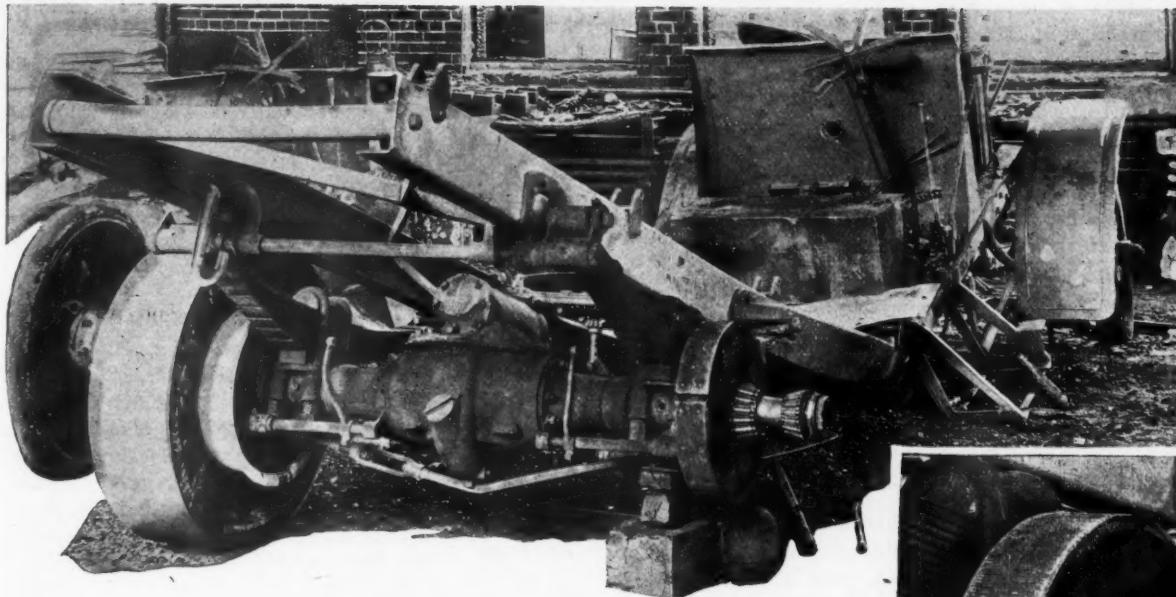
Miller Introduces Adona Tread for Repairing Worn Tires

AKRON, OHIO, Aug. 28—The Adona tread, which is stitched to an old tire carcass much as new soles are sewed to old shoes, has been brought out by the Miller Rubber Co., Akron, Ohio. The new tread consists of a complete new tread, containing fabric, cushion and breaker strip and, unlike retread bands, can be applied to a tire which has been worn down until the daylight shows through, provided the side-walls and bead are in good shape. In fact, it is practically a complete new casing, but without side-walls or beads. Although made with the Miller Geared-to-the-Road tread, these treads may be applied to any other make of tire.

Pennsylvania Has New Tread

JEANNETTE, PA., Aug. 28—The Pennsylvania Rubber Co., this city, has brought out a new tire with a tread of tough black rubber. The design, as indicated by the name Bar Circle, is a combination of heavy bars and circles. A 3500-mile guarantee is given.

The prices of these new tires have been figured on a basis of cost of production plus a modest margin of profit. The 30 by 3 in. is selling at \$10.35 and the 30 by 3½ in. at \$13.45, both considerably lower than on the Vacuum Cup and Ebony Tread types.



Brake Lining Survives 1500 Deg. Test

BUFFALO, N. Y., Aug. 26—Enduring a heat of 1500 deg. Fahr. and emerging from the ordeal unscathed is the record of the Raybestos brake lining illustrated above. The truck on which the lining was mounted was subjected to the full blast of the recent fire at the plant of the Atterbury

Motor Car Co., this city, and the intensity of the flames is strikingly brought out in the warped frame and charred wood of the wheels. Even the steering wheel has been burned off the spider. The asbestos, wire and compound of the brake lining, however, survived uninjured.



Erbes To Concentrate in St. Paul

Waterloo Plant To Be Established in Duesenberg Factory

ST. PAUL, MINN., Aug. 26—L. C. Erbes, owner of the former Duesenberg Bros. plant in this city, is planning to remove to St. Paul the automobile plant he owns at Waterloo, Iowa, and to establish it in the Duesenberg factory.

Mr. Erbes will build automobiles in this plant, and as a result a \$75,000 addition will be erected to accommodate from 100 to 150 workmen.

Some time ago Mr. Erbes bought up the Clarke-Carter Automobile Co. and the Cutting Car Co., and has been continuing manufacturing these machines at Waterloo, along with a car bearing his name. He plans to combine these under the name L-C-E, and to manufacture parts for all three cars.

Columbus Gear Co. Busy

COLUMBUS, OHIO, Aug. 25—J. W. Graham, vice-president and general manager of the C. A. S. Products Co., formerly the Foster Gear Co., has returned from Indianapolis, where he received a contract for 10,000 gears. Under the di-

rection of Mr. Graham the plant has been placed upon an efficiency basis and the number of employees increased to 130, with a weekly pay-roll in the shop of over \$2,000. Orders now on the books of the company will take the increased output of the plant from now until July 1.

Teetor-Hartley Doubles Capacity

HAGERSTOWN, IND., Aug. 24—The Teetor-Hartley Motor Co. is doubling its factory capacity at an expense of approximately \$22,000. An additional 8640 sq. ft. of floor surface will be completed by Oct. 1 at a cost of \$12,000 and machinery to the value of \$10,000 will be immediately installed. Fifty more men will be added to the payroll.

Stephens Plant at Full Capacity

FREEPORT, ILL., Aug. 26—Orders were issued this week to the various departments of the Stephens Motor branch of the Moline Plow Co., to operate the plant to the fullest capacity. This will enable the company to market fifty to sixty cars a week. A marked shortage of experienced mechanics has affected the output, but the present force will be increased as rapidly as possible. Material is being ordered for next year when it is hoped to turn out several thousand cars.

Bela Body Company Buys Factory

Takes Over Standard Woven Fabric Co. Framingham Plant

FRAMINGHAM, MASS., Aug. 28.—The Standard Woven Fabric Co., which recently moved to Walpole, has sold its plant at Framingham and it is to be occupied by the Bela Body Co., of Amesbury, who will operate the whole property for the production of automobile bodies. The main building is of modern concrete construction, 53 by 224, three stories, having about 40,000 ft. of manufacturing space, and an attached fire-proof boiler house, all equipped with sprinkler system and other modern conveniences. There is 108,720 ft. of land bordering on the railroad. Town assessment places \$43,550 on the building and \$7,570 on the land, making a total of \$51,120.

Jordan Builds Five Cars a Day

CLEVELAND, OHIO, Aug. 26—Since Aug. 1 the Jordan Motor Car Co. has been producing five cars a day and it is expected that the maximum for this season, ten a day, will be reached early in September. The company has erected a

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huge tent adjoining its new factory in order to extend its inspection facilities.

While 2600 dealer applications were received from the first advertisements of this company in THE AUTOMOBILE, *Motor Age* and *Motor World*, only 100 will be appointed for the present.

The Jordon Building Co. has taken formal title to the new plant of the Jordon Motor Car Co. from the Citizens' Savings & Trust Co., the indicated consideration being \$75,000.

Metropolitan Motors, Inc., Organized

NEW YORK CITY, Aug. 26—The Metropolitan Motors, Inc., has been established with a capital of \$1,000,000 to manufacture a light delivery vehicle and to take over the business of the White Star Motor & Engineering Co. W. C. Mack, one of the Mack brothers who started the Mack truck, is the moving spirit in the new venture, and it is said to be his survey of present market conditions that impelled the concern to undertake the production of a $\frac{1}{2}$ -tonner at a price which will be about \$695.

To Continue White Star

The White Star trucks of 2, 3 and 5 tons' capacity will be continued. The stock in the new concern is all common. Production is expected to start between Oct. 1 and 15.

Dividends Declared

Linde Air Products Co.; $1\frac{1}{2}$ per cent on preferred, payable Oct. 2 and 2 per cent on common, payable Sept. 30, both to holders of record Sept. 20.

Kelly-Springfield Tire Co.; quarterly of $1\frac{1}{2}$ per cent on 6 per cent preferred, payable Oct. 2 to stock of record Sept. 15.

Redden Increases Capital to \$500,000

DETROIT, MICH., Aug. 28—The Redden Motor Truck Co., producing the Redden truck maker, has increased its capital to \$500,000 to take care of factory increases.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum, lb.	.57	.57	.58	.58	.58	.58	+.01
Antimony, lb.	.13 $\frac{1}{2}$	.13 $\frac{1}{2}$	.13 $\frac{1}{2}$	.13 $\frac{1}{2}$	.13 $\frac{1}{2}$	.13 $\frac{1}{2}$	...
Beams and Channels, 100 lb.	2.77	2.77	2.77	2.77	2.77	2.77	...
Bessemer Steel, ton.	45.00	45.00	45.00	45.00	45.00	45.00	...
Copper, Elec., lb.	.27	.28	.28	.28	.28	.28	+.01
Copper, Lake, lb.	.27	.28	.28	.28	.28	.28	+.01
Cottonseed Oil, bbl.	9.06	9.06	9.07	9.40	9.26	9.25	...
Fish Oil, Menhaden, Brown, gal.	.55	.55	.55	.55	.55	.55	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	.23	...
Lard Oil, prime, gal.	1.10	1.10	1.10	1.10	1.10	1.05	-.05
Lead, 100 lb.	6.72 $\frac{1}{2}$	6.70	6.70	6.70	6.70	6.70	-.02 $\frac{1}{2}$
Linseed Oil, gal.	.72	.72	.72	.72	.72	.72	...
Open-Hearth Steel, ton.	45.00	45.00	45.00	45.00	45.00	45.00	...
Petroleum, bbl., Kans., crude	.95	.95	.95	.95	.90	.90	-.05
Petroleum, bbl., Pa., crude	2.30	2.30	2.30	2.30	2.30	2.30	...
Rapeseed Oil, refined, gal.	.90	.90	.90	.90	.90	.90	...
Rubber, Fine Up-River, Para.	.68	.68 $\frac{1}{2}$	.68$\frac{1}{2}$	.68$\frac{1}{2}$	.68$\frac{1}{2}$	.68$\frac{1}{2}$	+.00 $\frac{1}{2}$
Rubber, Ceylon, First Latex	.58 $\frac{1}{2}$	.57 $\frac{1}{2}$	.57 $\frac{1}{2}$	.57 $\frac{1}{2}$	.57 $\frac{1}{2}$	.57 $\frac{1}{2}$	-.01
Sulphuric Acid, 60 Baume, gal.	2.50	2.50	2.50	2.50	2.50	2.50	...
Tin, 100 lb.	38.50	38.63	38.63	38.63	39.25	39.25	+.75
Tire Scrap, lb.	.05 $\frac{1}{2}$	.05 $\frac{1}{2}$	.05 $\frac{1}{2}$	.05 $\frac{1}{2}$	.05 $\frac{1}{2}$	.05 $\frac{1}{2}$	...

Rittman Gasoline 6.9 Cents per Gal.

Twenty Plants in Operation Indicate that Process Is Commercially Practical

WASHINGTON, D. C., Aug. 28—"It costs anywhere from 6.9 to 12.8 cents per gal. to make a gallon of gasoline by the Rittman process. The variation is due to the range of fuel-oil prices between 50 cents and \$2.10 per barrel." This is an excerpt taken from a letter by Director Manning of the Bureau of Mines. Up to May 26, there were twenty factories licensed to use the Rittman process and the data is obtained from such of these that have actually been in operation. Summing up the results of the experiments thus far, Director Manning states:

Cost of Plants

"The capacity of a single tube was 1.55 per hr., or 37.2 bbl. per 24 hr., the loss 10 per cent, with a yield of 22 per cent gasoline, the balance being fuel oil. Estimated cost of a five-tube plant, \$15,000. Estimated cost of building to house plant, \$5,000. Total cost, \$20,000. Monthly capacity, 5580 bbl. Deducting 10 per cent for shut-downs, leaves net capacity slightly more than 5000 bbl. Assuming yield of gasoline at 20 instead of 22 per cent, gives 1000 bbl. (42,000 gal.). Loss of 10 per cent equals 500 bbl. Residuum, 70 per cent or 3500 bbl.

Expense, 5000 bbl. fuel oil at \$2.10 per bbl., \$10,500; labor for one month, six men, \$560; fuel, \$200; electricity, \$100; repairs, \$100; 6 per cent interest charge and 6 per cent depreciation on first cost, \$200; refining cost at 20 cents per bbl. (Oklahoma refining cost), \$1,000; total expense, \$12,660. Credit, 3500 bbl. residuum at \$2.10, \$7,350; net cost of 1000 bbl. (42,000 gal. gasoline, \$5,310; cost of gasoline, 12.64 cents per gal.

Estimate based on oil at 50 cents a bbl.:

Expense, 5000 bbl. oil at 50 cents per bbl., \$2,500; labor, \$560; fuel, \$200; electricity, \$100; repairs, \$100; 6 per cent interest charge and 6 per cent depreciation, \$200; refining cost (Oklahoma refining cost) at 20 cents per bbl., \$1,000; total expense, \$4,660. Credit 3500 bbl. residuum at 50 cents, \$1,750; cost of 1000 bbl. (42,000 gal.) of gasoline, \$2,910; cost of gasoline, 6.9 cents per gal.

Gasoline Prices Stable

NEW YORK CITY, Aug. 29—Gasoline prices throughout the country remained, for the most part, unchanged last week. Wholesale prices in this section were stable, though the consumers were paying from 23 to 26 cents per gallon. Gasoline in New York, Long Island, Westchester and Connecticut is being sold by the Standard Oil Co. at 23 cents wholesale. In New Jersey the price is 21 cents. Retail prices there range from 23 to 25 cents per gallon. Texas and Gulf Refining prices remain the same as last week. Texas prices in this territory are 23 cents wholesale and 21 cents in New Jersey. Gulf Refining gasoline is selling wholesale in this territory at 23 cents and in New Jersey at 22 cents per gallon.

Copper Raised to 28 Cents a Lb.

NEW YORK CITY, Aug. 29—Steadiness marked the quotations on automobile materials last week. Though a few of the metals and oils made changes in prices, there was nothing unusual to change the general routine of the market activities.

Copper sellers and producers are now asking 28 cents a pound for November and December delivery. One large agency is out of the market entirely for all copper before December, stating that it is only receiving inquiries for December or January metal. The copper market is very strong and there is no indication of any let up in demand.

Aluminum 58 Cents per Pound

Aluminum has again reached 58 cents a pound. A report from Milwaukee states that the shortage of pig and sheet aluminum supplies has forced several manufacturers of aluminum goods in Wisconsin to close down temporarily. Stocks are coming very slowly and little is to be had at any price, it is said.

Reports from Pittsburgh claim that the automobile makers are now featuring the steel market there with requests to be permitted to close for their steel requirements over the first half of 1917. The steel makers have refused to consider 1917 steel for the automobile makers before Oct. 1. They are in the market for black sheets, and it is estimated that 1,000,000 tons will be asked by the leading makers.

Firestone Features Securities

1000 Mark Reached in a Gain of 65 Points—A Record High Price

NEW YORK CITY, Aug. 30—The automobile and accessory issues were lower and listless last week. Most of the prices were considerably lower than the previous week, especially on the Stock Exchange. The issues traded on the Curb were quiet at the beginning of the week, but have since picked up and have managed to make their losses smaller.

In marked contrast are the reports from the Cleveland Exchange, where most of the tire issues are traded in. Firestone common sold yesterday at \$1,000 a share and established a landmark. That is the highest price at which a rubber stock ever sold in northern Ohio, and probably in the world. The market appreciation of the stock is indicated by comparison with the following figures in former years: In 1914 the high was 305½ and the low 247½; in 1912 the figures were 326 and 200½; and in 1910 127½ and 105.

Outside of the old Standard Oil, still traded here in the East, few issues have achieved Firestone's mark. There is a possibility of a readjustment of capital.

The rest of the tire issues were also strong and in large demand. Goodyear

common reached 240, a gain of 5 points. Both the common and preferred of the Portage company rose 20 points.

Two more companies were added to the large list on the securities market, Republic Truck and Fisher Body both being introduced to the public. Two thousand shares of the latter stock were traded in at prices running from \$38 to \$38½. Republic Truck sold yesterday at 55.

Several of the Curb issues were the objects of aggressive professional selling yesterday and declined as a result. United Motors declined in the early dealings from 62½ to as low as 60½, recovering to 60½. Chevrolet shared this weakness to some extent, selling from as high as 198 to as low as 193½ and closing at 197.

Chalmers, General Motors, Maxwell, Overland, and Studebaker were weak.

McClurg to Reorganize

COSHOCTON, OHIO, Aug. 25—Prior to a reorganization of the McClurg Tire & Rubber Co., a receivership has been asked by J. S. McClurg, L. C. McCurday and Dr. Jesse McClain. The plaintiffs are sureties on notes aggregating \$17,500.

Gets 105 Counties in Texas

DALLAS, TEX., Aug. 25—The S. G. Davis Motor Car Co., Dallas, has been organized to control the sales and service departments of the Oldsmobile company in 105 counties of Texas.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915		1916		Wk's Ch'ge
	Bid	Asked	Bid	Asked	
American Motors (or as named)...	..	..	64	66	— 2%
Ajax Rubber Co. (new)...	..	..	82	85	— 2
J. I. Case pfd.	70	80	150	170	— 20
Chalmers Motor Co. com.	90½	92	95	97	— 1
Chalmers Motor Co. pfd.	95	97	98	103	— 1
*Chandler Motor Car Co. ....	..	..	103	105	— 1
Chevrolet Motor Co. ....	..	..	197	202	— 1
Fisher Body Corp. ....	..	..	39½	40	..
Fish Rubber Co. com. ....	..	..	150	..	..
Fish Rubber Co. 1st pfd. ....	..	..	..	..	..
Fish Rubber Co. 2d pfd. ....	..	..	..	..	..
Firestone Tire & Rubber Co. com.	525	530	1000	..	+ 65
Firestone Tire & Rubber Co. pfd.	111	112	113	..	..
*General Motors Co. com.	219	220½	525	575	— 35
*General Motors Co. pfd.	109½	110½	121½	122	— 3½
*B. F. Goodrich com.	62	63	71½	72½	— ½
*B. F. Goodrich pfd.	106	108	113½	113½	— ½
Goodyear Tire & Rubber com.	270	274	240	245	+ 5
Goodyear Tire & Rubber pfd.	108½	110	106½	107½	+ ½
Grant Motor Car Co. ....	..	..	7	8	+ ½
Hupp Motor com. ....	..	..	6½	7	..
Hupp Motor pfd. ....	..	..	80	100	..
International Motor Co. com.	28	30	6	10	..
International Motor Co. pfd.	59	60	15	20	..
*Kelly-Springfield Tire & Rubber com.	185	190	73½	74½	+ 1½
*Kelly-Springfield Tire & Rub. 1st pfd.	85	87	95	97	— 1
*Lee Rubber & Tire Corp. ....	..	..	44	45	— 1½
*Maxwell Motor Co. com.	42	43½	82½	83	— 1½
*Maxwell Motor Co. 1st pfd.	90	92	85	86½	..
*Maxwell Motor Co. 2d pfd.	35	37	54½	57	— 2½
Miller Rubber Co. com.	190	194	220	226	..
Miller Rubber Co. pfd.	107½	..	105	106	..
Mitchell Motors ....	..	..	66	67	+ 1
Packard Motor Car Co. com.	117	..	165	172	— 5
Packard Motor Car Co. pfd.	100	..	100	104	+ 1
Paige-Detroit Motor Car. ....	..	..	46	50	..
Peerless Truck & Motor Corp. ....	..	..	24½	25	— 1
Perlman Rim Corp. ....	..	..	..	..	..
Portage Rubber Co. com.	46	48	150	152	+ 20
Portage Rubber Co. pfd.	93	94	150	152	+ 20
Regal Motor Co. pfd. ....	..	..	17	22	..
Reo Motor Truck Co.	17	18½	36	37	+ 1
Reo Motor Car Co.	33	34½	43½	44	+ 3½
Republic Motor Truck. ....	..	..	55	56	..
Saxon Motor Car Co. ....	..	..	72	73	— 5
Springfield Body ....	..	..	84½	85	+ 3½

	1915		1916		Wk's Ch'ge
	Bid	Asked	Bid	Asked	
Standard Motor Co. ....	..	..	6½	7½	+ ½
Stewart-Warner Speed. com.	65	66	117	120	+ 3½
Stewart-Warner Speed. pfd.	105	107	..	..	..
Stromberg Carburetor ....	..	..	42½	42½	— 2
*Studebaker Corp. com.	111½	112½	125½	125½	— 4½
*Studebaker Corp. pfd.	103	105	107½	110½	— 1½
Stutz Motor ....	..	..	65	65½	..
Swinehart Tire & Rubber Co.	88	90	95	100	..
United Motor Corp. ....	..	..	60½	61	— 3½
*U. S. Rubber Co. com.	49	51	56½	57	— 1½
*U. S. Rubber Co. pfd.	103	105	111½	112	+ 7½
White Motor Co. (new) ....	..	..	53½	54	— ½
*Willys-Overland Co. com.	182	184	46	46½	— 9
*Willys-Overland Co. pfd.	106	106½	104½	105	+ ½

*At close Aug. 28, 1916. Listed New York Stock Exchange.
Quotations by John Burnham & Co.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	1915		1916		Wk's Ch'ge
	Bid	Asked	Bid	Asked	
ACTIVE STOCKS					
Auto Body Co. ....	..	..	36½	38½	..
Chalmers Motor Co. com.	89½	..	165	..	..
Chalmers Motor Co. pfd.	95	97	103	..	..
Continental Motor Co. com. ....	..	300	35½	36½	..
Continental Motor Co. pfd.	83	87	9½	10½	..
Ford Motor Co. of Canada. ....	..	1525	320	340	..
General Motors Co. com.	217	221	540	590	..
General Motors Co. pfd.	109	111	120	124½	+ 4
Maxwell Motor Co. com.	41½	45	82	85½	— ½
Maxwell Motor Co. 1st pfd.	89	92	85	88	— ½
Maxwell Motor Co. 2d pfd.	35½	39	54	57	— 2
Packard Motor Car Co. com.	120	130	165	172	..
Packard Motor Car Co. pfd.	100	102	101	103	..
Paige-Detroit Motor Car Co. ....	..	45	50	..	..
W. K. Prudden Co.	20½	22	42½	44½	..
Reo Motor Car Co. ....	..	33½	42½	43½	+ ½
Reo Motor Truck Co.	17½	18	36	..	..
Studebaker Corp. com.	112	115	124	126½	— 5½
Studebaker Corp. pfd.	102	106	105	..	..
C. M. Hall Lamp Co. ....	..	..	..	80	..
INACTIVE STOCKS					
Atlas Drop Forge Co.	27	30	30	..	..
Kelsey Wheel Co.	205	..	55	60	..
Regal Motor Car Co. pfd. ....	..	21	17	..	..

Street Railways Use Motor Buses

English Lines Find Them Profitable Auxiliaries—American Cos. Adopt Them

NEW YORK CITY, Aug. 25—Several English street railway companies are finding the use of motor omnibuses profitable as feeders or auxiliaries to their rail service, and at the last annual convention of the American Electric Railway Assn., held in San Francisco, it was decided to investigate the possibilities of supplementing the regular street car service with motor buses in this country. Thus, the final outcome of the fight that the street car companies everywhere have made against the jitney bus may be the adoption of regular buses by the companies themselves.

The motor bus section of the Sheffield Corporation Tramways in England earned a gross profit of \$26,850 during the business year ended March 25, 1916. The company operated twenty-one buses in regular service on ten routes totaling 30 miles in length, five of which extend for a considerable distance beyond the city limits. More than 500,000 miles were traversed by the buses during the year.

The Birmingham Corporation Tramways earned a profit of more than \$50,000 in the year ended March 31. Its forty-one motor buses carried 6,300,000 passengers and covered 938,226 miles, earning a gross average revenue of nearly 25 cents per bus-mile, while operating expenses averaged less than 18 cents per bus-mile.

Other English systems operating motor buses are the York Corporation Tramway Department (four), Oldham county borough (three) and Bournemouth Corporation Tramways.

All of these municipally-owned services are finding that the motor bus is giving them a new lease of life, for without spending large sums on permanent track and overhead equipment, fresh revenue is brought in. The buses, while not always showing profits themselves, increase the traffic on the rail lines.

A year ago the United Railways & Electric Co., of Baltimore, organized the Baltimore Transit Co. and began operating twenty-five twelve-passenger buses to determine their desirability as an adjunct to the regular trolley-car system.

Making Tractor Cultivator

BLOOMINGTON, ILL., Aug. 25—The Illinois Silo Co., this city, has commenced the manufacture of a new tractor cultivator, patented by W. M. Springer, who for 25 years, was the designer of

the Avery Mfg. Co., Peoria, Ill., and who will be in charge of the plant. The various sections of the tractor will be cast at various foundries and the finished parts assembled. The Springer machine will operate with any kind of gasoline or kerosene engine of more than 4 hp. The tractor complete with engine weighs from 2100 to 2400 lb. The frame is adjustable, so that it can be fitted to plows, cultivators, rakes, harrows, planters and other implements which the farmers use in their yearly labors.

Gehl Bros. Make Tractor

WEST BEND, WIS., Aug. 25—The Gehl Bros. Mfg. Co., West Bend, Wis., a large manufacturer of power and manual farm implements and machinery, is now engaged in the regular production of a new type of general utility farm tractor, propelled by a four-cylinder gasoline-kerosene engine, of 4 1/4 by 5 3/4 in. bore and stroke, and rated at 25-hp., at 900 r.p.m.

Ottawa Is Good Car Market

OTTAWA, ONT., Aug. 24—Ottawa people have been seized with a sort of craze for automobiles, and dealers have found this city is the most profitable field in the country. There are at present about 2500 automobiles and trucks in the city, or one for every forty of the population. Dealers declare that they have sold twice as many cars in July and August this year as in 1915. One dealer stated that his sales for the month of August are about 90 per cent better than last year. About 35 or 40 per cent of the cars sold by this agent were for commercial use.

In the whole Ottawa Valley as well as the city the demand for automobiles has been far ahead of last year. The good roads demonstrations and the prospect of better roads in the near future have awakened many to the desire of owning a car. A dealer who has been canvassing the country for a radius of about 50 miles around Ottawa says that there are very few farmers in that area who are not counting on buying an automobile before this time next year.

Kansas Expects 300% Sales Increase

TOPEKA, KAN., Aug. 14—Only the failure of the Kansas corn crop can prevent the automobile dealers of Topeka from selling from three to six times as many cars this season as were sold last year, is the opinion of local automobile dealers. The fall sales activity has begun and prospects point toward a wonderful season. Practically every agency is receiving or soon will receive large shipments of 1917 models. A number of dealers have begun distribution of cars.

N.Y.C. 6 Months Fees \$1,100,203

116,482 Owners, 770 Dealers and 59,430 Chauffeurs Register from City

ALBANY, N. Y., Aug. 25.—Automobile owners in this city contributed \$1,100,203 in registration fees to the State during the 6 months between Feb. 1 and July 31. These fees came from 116,482 owners, 770 dealers and 59,430 chauffeurs. During the month of July alone 5615 owners registered in this city.

Next to New York City, Buffalo turned in more money than any other city in the State, with Albany third. From Buffalo there were registered 85,417 owners, 744 dealers and 14,548 chauffeurs. The fees they contributed amounted to \$661,118.

Albany had a registration of 70,263 owners, 803 dealers and 14,613 chauffeurs. Its contribution was \$551,277. The total for the three cities was \$2,312,599.

Curiously, New York City has far fewer dealers, in comparison with its population, than the other large towns of the State, having only a few more by actual count than Buffalo and considerably less than Albany.

232,017 Cars in Ohio

COLUMBUS, OHIO, Aug. 24.—W. H. Walker, Ohio registrar of automobiles, in a report covering the present year up to and including Aug. 24 shows that there are 232,017 automobiles in Ohio. Since the first of the year the department has registered 224,700 individual gasoline car owners and 4,443 electric owners. During the same period dealers to the number of 2874 have been registered. Now each dealer has at least one car and many of them have several demonstrators, but counting one car each there are 2874 cars owned by dealers. The total is 232,017.

7800 Cars in Alberta

EDMONTON, ALTA., Aug. 26—There are 7800 cars in Alberta as compared with 5835 last year, a gain of 1965.

Last year the number of cars bought in the fall months was quite large and these were to quite an extent purchased by farmers. This year the sale of cars to rural communities is large and all the manufacturing companies are receiving good business from country districts.

42,000 Cars in Georgia

ATLANTA, GA., Aug. 28.—According to records in the office of the secretary of state there are over 42,000 cars in Georgia against 25,000 for all of last year, a gain of 17,000.

36 Cars Entered for Cincinnati

Leading Racing Machines and Drivers in 300-Mile \$30,000 Race

CINCINNATI, OHIO, Aug. 28—Thirty-six entries have been received to date for the 300-mile race to be held on the new Cincinnati 2-mile board speedway, Labor Day. The opening race is for \$30,000 in prizes and the entries follow:

Car	Driver	Car	Driver
Peugeot	Resta	Sunbeam	Galvin
Mercedes, De Palma		Chadwick	Victor
Maxwell		Duesenberg	Milton
Rickenbacher		Adams	Adams
Maxwell, Henderson		Olsen (Un-named)	
Peugeot	Mulford	Hudson (Un-named)	
Sunbeam, Christiaens		Duesenberg	
Peugeot	Merz	Omar	Toft
Peugeot	Aitken	West Duluth	
Stutz	Anderson	Rawlings	
Premier	Wilcox	Cino	McNay
Crawford	Chandler	Osteweg	Osteweg
Crawford	Lewis	Hoskins	Hoskins
Olsen	Johnson	Oberting	Oberting
Hudson	MacBride	Premier (Un-named)	
Hudson	Vail	Dans L'Agent	
Delage	Franchi	Muller	
Delage	De Vigne	Frontenac, Chevrolet	
Duesenberg	D'Alene	Kleinart	Klein
L. C. Erbes	Gable		

Road Race Postponed to Spring

SAN BERNARDINO, CAL., Aug. 22.—The Los Angeles-to-Salt Lake road race which was to have been held in October, has been postponed until next April. The weather has been so hot on the desert that it was impossible to get men to work on the road and put it in condition for the event.

50 Exhibitors at Indianapolis

INDIANAPOLIS, IND., Aug. 28—Nearly 200 products will be shown at the Fall automobile show, which will be given in a large tent close to the Coliseum in the Indiana State fair ground, Sept. 4 to 8. This will be the largest show ever staged by the Indianapolis Automobile Trade Assn., there being more than fifty exhibitors showing products of seventy different factories.

The accessories exhibit, which heretofore has taken up much space, will be quite limited to make room for the new models of automobiles.

38 Cars on Exhibition at Columbus

COLUMBUS, OHIO, Aug. 28—The usual fall automobile show, held in conjunction with the Ohio State Fair, started to-day in South Machinery Hall at the fair grounds in this city and will last for a week. The show is under the auspices of the Columbus Automobile Show Co. Thirty-eight cars and many trucks are being shown.

The following cars are on exhibition:

The cars shown were: Briscoe, Buick, Cadillac, Chalmers, Chevrolet, Cole,

Dorris, Dodge, Dort, Detroit electric, Eclear, Elgin, Empire, Franklin, Haynes, Hudson, Jeffery, Kissel, Liberty, Madison, Maxwell, Marmon, Metz, Milburn electric, Oakland, Overland, Owen Magnetic, Packard, Paterson, Pathfinder, Pierce-Arrow, Reo, Roamer, Saxon, Studebaker, Velie, Westcott, Willys-Knight and many trucks.

Receiver for Twin City Speedway

MINNEAPOLIS, MINN., Aug. 25.—The succession of troubles of the Twin City speedway since its opening last fall has finally drawn it into the hands of a receiver. Bids for the sale of the plant in whole or in parcels have been authorized by the court and the sale has been put into the hands of Phil Herzog of St. Paul. No limit as to the date of sale has been given.

The local speedway was America's first concrete oval and cost approximately \$603,000. The 2-mile oval finished in August, 1915, did not come up to expectations in regard to structure and public support. The last race on it, July 4, was a loss financially due to lack of attendance. The cement track at that time was just as rough as it was last year, little attempt having been made to improve it.

Hupmobile on Capital-to-Capital Tour for Good Roads

DETROIT, MICH., Aug. 28—A 25,000-mile capital-to-capital tour by a Hupmobile in the interest of good roads was officially started to-day at Washington, D. C. The plan is to visit the capital of each state and to invoke interest nationally in good roads through the state road officials and others having charge of road matters.

From Washington the car proceeds north to Annapolis, Md., and thence to Harrisburg, the capital of Pennsylvania. Following a visit to all of the Eastern and New England capitals, the route then proceeds to Albany and across New York State to Buffalo, where the car swings southward to Columbus and Charleston, W. Va., then back to Indianapolis, Detroit and Lansing. Thence the route goes westward northerly to Seattle and down the Pacific Coast to Los Angeles and back to San Francisco. Then the car is driven eastward via Carson City, Ogden, Salt Lake City and Cheyenne to Denver.

The route zig-zags north and south, taking in all of the capitals until it finally comes up through the Carolinas to Richmond, and thence back to Washington.

The trip is in charge of J. S. Patterson and the car is driven by C. E. Salisbury and George Lipe, both of Detroit, and the fourth member of the party is W. A. Krohn.

The reports to be made by the party are to be both written and photographic.

Races for Fords at Chicago

Five Events, 10 to 50 Miles, for Recent Models for Labor Day

CHICAGO, ILL., Aug. 29—Sanction has been granted by the American Automobile Assn. for a series of races for Ford cars to be held on Labor Day at the Chicago Speedway. The races, which will be open to Fords of 1913 or later manufacture, will be arranged as follows: 10-mile Chicago Championship; 20-mile Cook County championship; 30-mile Illinois championship; 40-mile Tri-State championship for Illinois, Indiana and Wisconsin cars only, and 50-mile Interstate championship for which the greatest number of prizes will be offered, including a Ford touring car.

This is the first time in America that a speed contest on a major track has been limited to cars of one make. Ford races have proved popular on the half-mile and mile dirt tracks of the County Fair Circuit and the promoters of the Labor Day event believe that a series of Ford races on the Chicago speedway will bring out a good crowd of Ford fans. Between 20 and 30 cars have been entered tentatively.

Two Killed at Kalamazoo

KALAMAZOO, MICH., Aug. 27—Jack Peacock and Marion Arnold were killed and eight others injured to-day when eleven of fourteen cars piled up at the first turn during the 100-mile race on the 1-mile dirt track at Recreation Park, this city.

The twelve-cylinder Sunbeam which Peacock drove skidded at the start of the race on the first turn and struck the fence. The car was overturned and thrown squarely across the track, and ten of the other machines plowed into it. The Stutz, driven by Andy Burt, whose mechanician, Arnold, was killed, was the first to strike Peacock's car. Peacock was in partnership with Charles Hanson under the style Hanson-Peacock Corp., Brooklyn, N. Y., National car dealer.

40 Exhibitors at Milwaukee Show

MILWAUKEE, WIS., Aug. 26—Forty dealers are exhibiting eighty-five makes of cars at the second annual automobile show in this city under the auspices of the Milwaukee Automobile Dealers, at the State Fair Park, Sept. 11 to 16. The big Machinery Hall is again being used.

New N. Y. Taxicabs' Rates Lower

NEW YORK CITY, Aug. 25.—Taxicab service at 10 cents a mile lower than the

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old rates went into effect here today. Though there are only two of these new rate taxicabs in service at present, there will be 200 by Oct. 1. The Black & White Co., organized by New York and Chicago taxicab interests, owns the cars. The company's garage will be 310 to 326 West 68th Street.

The new rate will be 20 cents for the first one-third mile and 10 cents for each additional one-third mile. Thus, the first mile will cost 40 cents, and all miles thereafter will be 30 cents. The common existing rate is 30 cents for the first half mile and 10 cents for each additional quarter, with an extra charge when more than two passengers are carried. The new charge is regardless of the number of passengers.

The new taxicabs will have electric lighting and will have an electric device on the outside of the car which illuminates the numbers on the houses and assists the driver in readily finding places.

The car presents the appearance of a private limousine. In the winter it will be equipped with heating apparatus and rugs. It was the type of car that has been so successful in Chicago, the same interests being behind the enterprise jointly with the local concern.

Paris Buses Again Running

PARIS, FRANCE, Aug. 25.—The local motor bus service has been partially re-established with a single route served by thirteen buses running on a 5-min. schedule. This service was withdrawn 22 months ago on account of the war. The newly established line is over the main boulevards from the Madeleine to the Bastille.

Electric Vehicles at Electrical Exposition

NEW YORK CITY, Aug. 29—Electric passenger and commercial vehicles, as well as accessories, will hold a prominent place in the New York Electrical Exposition at Grand Central Palace, Oct. 11 to 21. A test run is now being planned to be held during the exposition. The Electric Garage, this city, will have an exhibit representative of the work it is carrying on. Among the pleasure vehicles will be the Baker, R. & L. and Detroit cars. Among the exhibitors of commercial cars will be the General Vehicle Co., Walker Vehicle Co. and Ward Motor Vehicle Co. The Edison Storage Battery Co. and the Electric Storage Battery Co. will have exhibits.

47 Pathfinders Shipped to Petrograd

INDIANAPOLIS, IND., Aug. 30—The Pathfinder Company, this city, has started a train load of forty-seven cars, both touring and roadsters, for Petrograd, Russia. These cars are for trade and not for army purposes.

Ideal Army Truck Is Evolving

Commercial Use of Such a Type Expected Within 2 or 3 Years

WASHINGTON, D. C., Aug. 26.—Military transport experts believe efforts to develop a motor truck capable of meeting the needs of the army campaigning along the Texas border and in Mexico will cause the manufacture for commercial use of an ideal truck within the next 2 or 3 years. The army transport board has been in session here recently considering the preparation of specifications for each type of truck required by the army, upon which truck makers will be invited to bid.

The board found that the tests to which the army trucks were subjected on the border and in Mexico were the most severe that had been had in any part of the world. The conditions of service were quite abnormal, yet the performance of some of the trucks was remarkably good. Experts of the S. A. E., acting on the suggestion of the board, now are on the Mexican border studying at first hand the unusual conditions of weather, sandy grit and alkali existing there with a view to the still further improvement of the army trucks.

Franklin Roadster \$1,850

In the description of the new Franklin models published in THE AUTOMOBILE for July 27, the price of the four-passenger roadster was given incorrectly. This new model, for which the Franklin company is experiencing strong demand, sells for \$1,850.

Durant Interests Back of Big N. Y. Building

NEW YORK CITY, Aug. 25.—Automobile dealers in this city whose leases are about to expire or who are having trouble finding storage facilities will be interested to know that an eight-story building, serving the dual purpose of storage and service, is being planned. Interests identified with W. C. Durant are backing this. The building will provide close to 500,000 sq. ft. of floorspace, and though it is backed by General Motors and Chevrolet interests, it will not in any sense of the word be a G. M. C. proposition, but will be open for all.

This building will occupy the entire plot of ground on Eleventh Avenue, from 55th to 56th Streets, with a 200-ft. frontage on the avenue and on each street.

A modern fireproof building is to be

erected of either steel and concrete or steel and brick construction. Though the plan now calls for an eight-story building, it is likely that four more stories will be added.

Special high-speed elevator facilities will be provided. It is planned to divide the 40,000 sq. ft. on each floor into eight units, each unit being designed to provide both storage and service facilities.

N. Y. White Moves

NEW YORK CITY, Aug. 27.—Another break is about to occur in Automobile Row. The White Co., for 10 years located at Sixty-second Street and Broadway, has leased a large plot at the northwest corner of Park Avenue and Fifty-seventh Street, where it will construct a five-story building to house all the branches of its passenger car and truck departments. The plot has been leased for 21 years.

The impending removal of this company will mark the second important deflection from that district, the first having been that of the Simplex at the beginning of this month, when it located at Fifth Avenue and Fifty-eighth Street.

Buy Detroit Oldsmobile Branch

DETROIT, MICH., Aug. 28—An important change in local automobile circles has resulted from the buying out of the Oldsmobile factory branch by Wilbur H. Collins, son of R. H. Collins, former Buick sales manager and now a director of the General Motors Co., and F. J. Muellerschoen, who for several years was connected with the Philadelphia Buick branch. The Oldsmobile business will hereafter be conducted as a distributing organization with a territory including all of Michigan and nine counties in Ohio immediately adjacent to Toledo. R. C. Lowrie continues in the Detroit organization in charge of retail sales, and will retain the same selling staff.

Milwaukee Boosters' Tour Starts

MADISON, WIS., Aug. 28—If the enthusiasm which has marked the first day of the State fair boosting tour of the Milwaukee automobile dealers indicates anything, the 1916 fair should be the best in years.

Thirty-six cars representing the Milwaukee Automobile Dealers left this morning. Seven stops were made over a distance of 105 miles. At each stop the cars were parked in the center of the town and paraded throughout the downtown section. Stops to-day were at Waukesha, Oconomowoc, Johnson Creek and Jefferson for dinner, Lake Mills, Deer Field and Madison. To-morrow night's stop will be at Green Lake.

Factory Miscellany

Obenberger in New Forge Plant—The John Obenberger Forge Co., recently organized, with offices at 608 Majestic Building, Milwaukee, Wis., has occupied its new plant in West Allis, Wis., where it is turning out forgings for crankshafts, connecting-rods, worm shafts, gear blanks, etc.

To Make Accessories—The American Auto Trimming Co., Cleveland, Ohio, has been incorporated with a capital of \$100,000 and will establish a plant in the factory building of the Properties Co. on East Seventy-ninth Street, for the manufacture of automobile accessories. Among those interested are Benjamin Gotfredson and Frank Joyce, both at present engaged in a similar business in Detroit.

Buy Hercules Personal Property—The personal property of the Hercules Motor Car Co., Louisville, Ky., has been sold at auction for taxes amounting to \$5,582.42. It was bid in by the H. & P. Machine Tool Co., New York City, for \$6,100. The property comprised a large quantity of machinery and office fixtures, but not the real estate.

To Manufacture Tires—G. G. Meeley of the American Auto Tire Co., 154 North Broad Street, Philadelphia, Pa., has purchased the old Patterson textile mills in Chester, Pa. The mills will be enlarged and converted into an automobile tire factory. The structure now con-

sists of a main building, 316 by 76 ft., three stories; a two-story brick building, 188 by 80 ft.; a brick and frame building, 123 by 64 ft.; a brick building, 74 by 33 ft.; a brick boiler and engine house and a two-story brick and stone office building.

Takes Over Dimmer Business—The Auto Light Control Co., care of M. D. Elgin, 224 Charles Avenue, Detroit, has incorporated for \$25,000, taking over the business of the Grand Rapids Dimmer Co. It expects to manufacture and sell automobile light controls and specialties.

Allen Co. to Make Trucks—The Allen Street Sweeper & Auto Co., Allentown, Pa., will open a plant for the manufacture of commercial vehicles and street-cleaning machines. H. S. F. Barner, 1421 Munroe Street, Allentown, general manager, was connected for 12 years with Mack truck company.

Wald Machine Adds—The Wald Machine Co., Sheboygan, Wis., maker of automobile specialties, has started work on the erection of its new machine shop, 80 by 100 ft.

Buick Constructing Office Building—Plans for the immediate construction of a four-story office building on the site of the present office structure have been announced by the Buick Motor Co., Flint,

Mich., through General Manager W. P. Chrysler. The new structure will be 242 by 50 ft. and will be of fireproof construction of reinforced concrete, to cost \$240,000. It is planned to start work between Sept. 1 and 10, with a view to completing the new quarters before the first of the year. A larger building is made necessary because the force of office employees has completely outgrown the present rather large quarters.

Falls Motors Opens Bids—The Falls Motors Corp., Sheboygan Falls, Wis., formerly the Falls Machine Co., has opened bids in the office of Architect A. C. Clas, Colby-Abbot Building, Milwaukee, for the construction of two new buildings, which will materially increase the capacity of the plant before the end of the year. Plans call for a motor assembly shop, 119.7 by 119.6 ft. in size, and a motor repair shop, 72 by 85 ft., of modern reinforced concrete and steel sash construction, with concrete foundations and floors. A motor testing shop, 250 ft. long, and having accommodations for 120 motors at a time, has just been completed. The city of Sheboygan Falls is starting work on extensions of the waterworks system, so that the plant will have adequate fire protection and water service. Several streets are being vacated and opened for the benefit of the industry.

The Automobile Calendar

ASSOCIATIONS

Aug. 28-Sept. 1—Milwaukee, Wis., Booster Tour of Milwaukee Automobile Dealers.

Sept.—Indianapolis, Convention for Formation of Indiana Automobile Trade Assn., under auspices of N. A. T. A., Hotel Claypool.

Oct. 2-5—St. Louis, Fall Meeting Assn. of Automobile Accessory Jobbers.

Oct. 2-7—Kansas City, Mo., Dealers' Show, American Royal Live Stock Show; Kansas City M. C. Dealers' Assn.

Oct. 13—Flint, Mich., Fall Meeting National Assn. of Automobile Accessory Jobbers.

Dec. 2-9—Electricians' Country-wide Celebration.

CONTESTS

Sept. 4—Elmira, N. Y., Track Race, Elmira Auto and Motorcycle Racing Assn.

Sept. 4—Cincinnati, Ohio, Speed-way, Cincinnati Speedway Co.

Sept. 4—Des Moines Speedway Invitation Race. Limited to six entries.

Sept. 4—Elmira, N. Y., Track Race, Elmira Auto and Motorcycle Racing Assn.

Sept. 4—Cincinnati, Ohio, Speed-way, Cincinnati Speedway Co.

Sept. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

Sept. 4-5—Spokane, Wash., Track Race, Inland Auto Assn.

Sept. 9—Indianapolis Speedway Race.

Sept. 9—Newark, N. J., Track Race, Olympic Park, Racing Assn.

Sept. 16—Providence Speedway Race.

Sept. 18—North Yakima, Wash., Track Race, Washington State Fair.

Sept. 29—Trenton, N. J., Interstate Fair, H. P. Murphy, Racing Sec.

Sept. 30—New York City, Sheephead Bay Speedway Race.

Oct. 7—Philadelphia Speedway Race.

Oct. 7—Omaha Speedway Race.

Oct. 14—Chicago Speedway Race.

Oct. 19—Indianapolis, Ind., Race, Indianapolis Motor Speedway.

Oct. 21—Kalamazoo, Mich., Track Races, Kalamazoo, Motor Speedway.

Oct. 22-23—Los Angeles, Cal., Commercial Car Reliability Tour.

Nov. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

April, 1916—Los Angeles to Salt Lake City Road Race.

GOOD ROADS

Sept. 1-9—Cincinnati, Ohio, Good Roads Exposition and Convention, Music Hall, Hamilton County Dixie Highway Council of Cincinnati.

Sept. 6-7—St. Paul, Minn., Good Roads Congress, Auditorium.

SHOWS

Sept. 2-9—Cleveland, Ohio, Show, Industrial Exposition and Fair, Edgewater Park.

Sept. 2-9—Columbus, Ohio, Fall Show, Ohio State Fair, Columbus Automobile Show Co.

Sept. 4-8—Hartford, Conn., Show, Connecticut Fair Assn.

Sept. 4-9—Minneapolis, Minn., Show, State Fair.

Sept. 4-11—Indianapolis, Ind., Show, Indiana State Fair, Indianapolis Automobile Trade Assn.

Sept. 10-16—Milwaukee, Wis., Show, Wisconsin State Fair, Machinery Bldg.

Sept. 25-30—Salem, Ore., State Fair, Joseph M. Rieg, manager.

Oct. 14-31—Dallas, Texas, Show, State Fair.

Jan.—First Pan-American Aero-nautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.

Jan. 6-13, 1917—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 13-20—Montreal, Que., Show, Montreal Automobile Trade Assn.

Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.

Feb.—Newark, N. J., Show, First Regiment Armory.

Feb.—St. Louis, Mo., Show, Auto Manufacturers' and Dealers' Assn.

Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.

Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.

TRACTOR

Aug. 28-Sept. 1—Indiana Tractor Demonstration.

Sept. 4-8—Madison, Wis., Tractor Demonstration.

Sept. 11-16—Milwaukee, Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.

The Week in



the Industry

New England Trade Items—The Hawley-Cowan Co., Saxon agent, has moved into the building on Commonwealth Avenue vacated by the Cottrell Motor Car Co., that was handling the Pathfinder line.

The Becker-Stutz Co., Boston, Mass., has opened a branch at Providence with N. W. Rogers as manager.

The Worcester, Mass., Buick Co. has been formed, with C. M. Stanley, R. G. Clark and H. K. Noyes as officers. Mr. Noyes is the wholesale distributor of Buicks in New England.

The Drown Motor Car Co., Barre, Vt., that had the Buick agency, has sold its business to the Barre Garage Co. and H. G. Bennett.

D. E. Morgan has been appointed manager of the Metz branch at Providence, R. I.

The Autocar has been taken on by the Stoddard Motor Car Co., Springfield, Mass.

The Walter F. Kelley Co. has been organized at New Haven, Conn., to handle Vim trucks.

S. L. Rochette has given up the Ford agency at Lowell to take on the Chandler for that city, Nashua and Lawrence, in addition to the Dodge Bros. line. Harry Pitts has taken on the Ford.

The Redden Truck Maker has opened a Boston branch to handle the Massachusetts territory, with headquarters at 755 Boylston Street. J. B. McMahon, Jr., former manager of the New York branch, and N. J. Wallis, a Boston business man, are associated in the office.

The Henshaw Motor Co. of Boston has opened a branch at Lynn for the sale of Dodge cars.

C. E. Grimes has been appointed manager of the used-car department of the Cadillac Motor Co., Boston.

The Franklin Motor Car Co. of Boston has opened a branch at Worcester.

Recent Mich. Changes—A. C. Leverton, former general superintendent of the Chalmers Motor Co., Detroit, has been appointed to the position of factory manager of the Briscoe Motor Corp., Jackson. Leverton has had wide experience in his line, and previous to his Chalmers connection was works manager of the Cartercar Co. and before that general superintendent of the Brush Runabout Co.

W. F. French, a newcomer to the automobile field but a man who is thoroughly conversant with the purchasing end through mercantile experience in Chicago, has been made purchasing

Trade Happenings

agent for the Bour-Davis Motor Car Co., Detroit.

New Jordan Dealers—The new Jordan Motor Car Co., Cleveland, has appointed the following distributors: John G. Dale, 240 West Fifty-ninth Street, New York City; Motor Car Sales Co., Milwaukee; Chicago Motor Car Co., Inc., Chicago; Decrow Motor Sales Corp., Buffalo, N. Y.; R. W. Immasche & J. A. Johansen, St. Louis.

Burd Issues Double-Utility Book—The Burd High Compression Ring Co., Rockford, Ill., has issued to dealers a book giving the piston ring sizes of all cars, and at the right-hand side of each page columns for reporting the stock of rings carried by the dealer. The book is unusually complete.

Meyrick Succeeds Brussel—L. Meyrick, formerly of the Lavine Gear Co., Racine, Wis., has succeeded J. M. Brussel as general superintendent of the Ferro Machine & Foundry Co., Cleveland, Ohio. The latter has taken a similar position with the Delco company, Dayton, Ohio.

Kansas City Changes—The Bond Motor Co. has resigned the agency for the Oldsmobile and will add the territories of Kansas and northern Oklahoma under the Saxon agency.

The Marion-Handley Sales Co. was incorporated at Jefferson City, Aug. 25, with a capital of \$20,000 and the following officers: L. C. Cadenhead, president and manager; F. A. Britton, sales manager; Glen Bruner, counsel and director. W. B. Harrison will be city salesman. Other offices will be established at St. Joseph, Missouri, Lawrence, Topeka, Emporia, and Tonganoxie, Kan.

The Hiatt-Buick Co., Kansas City, Mo., handling retail sales of the Buick in Kansas City, is established at 1715 McGee Street. LeRoy Simons will be sales manager and J. B. Durkee will be outside salesman, traveling Jackson County. O. W. Hiatt, head of the company, was formerly manager of the retail sales department of the Buick Motor Car Co., Admiral Boulevard and McGee Streets, which hereafter will handle only the wholesale business of the territory. The used-car department of the Buick is also under the management of the new retail company.

The King Motor Sales Corp. has been organized and will take over the agency for King Eight, formerly handled by the Donnelly-Campbell Motor Co. The new company will move from 1706-1708 Mc-

Gee to 1901-1903 McGee, where a building is being remodeled for the purpose.

Ohio News Items—A. G. Fischer, general manager of the Fischer Auto & Service Co., Columbus agent for the Chalmers, has leased the first floor of a large building at Third and Rich Streets, in which a modern service station will be operated.

The Cornelius-Browning Auto Co., Toledo, has taken the agency for the Liberty in northwestern Ohio in conjunction with several other makes of cars.

The Campbell-Gilchrist Sales Co., Columbus agent for the Empire, is now quartered in a large storeroom at 15-17 North Fourth Street. Richard Cott has been placed in charge of the service station.

The Falls Rubber Co. has leased space at 1844 Euclid Avenue, Cleveland, and will open a branch for the sale of its product.

The Torbenson Gear & Axle Co. has purchased the three factory buildings of the Samuel Austin Co., 152nd Street and Nickel Plate Railroad, Cleveland, which it will use as its own factory with the addition of another building. The site contains 4½ acres.

The Mutual Auto Supply Co. has taken a 5-year lease on a double store in the Keystone Building on Chester Avenue, Cleveland, Ohio, to which it will remove from its present location on Euclid Avenue.

St. Louis Items—The Byerly Auto Co., East St. Louis, Mo., has been incorporated to handle Oldsmobile and Mitchell cars. It succeeds to the business of J. H. Byerly, who also is a shoe merchant. A. L. Perkins is manager of the automobile company and the showrooms at Tenth and State Streets have been remodeled.

The Packard Missouri Motor Co. has leased 1801-1807 Pine Street, formerly Donnelly Automobile Co., showrooms, as used-car salesrooms.

The Park Automobile Co. is showing the twelve-cylinder H. A. L. cars, for which the company has been named agent.

Barker Joins Kentucky Wagon Co.—J. M. Barker, for a number of years identified with the I. H. C. truck line in Alabama and the South, has joined the Kentucky Wagon Mfg. Co., Louisville, Ky. He has enlisted in the field force of that company and will cover Alabama and Georgia.